Rail Delivery Group

National Rail

The Twenty Point Plan

Fleet Management Good Practice Guide

Concise Version

Summary

This document has been produced to give a simplified overview of the RDG ReFocus Fleet Management Good Practice Guide, otherwise referred to as the 20-Point Plan (20PP).

Key stakeholders in Fleet Management (TOCs, OEMs, ROSCOs, Network Rail and others) face many diverse calls on their time. The content of this condensed guide is therefore intended to provide a quick and easy to understand overview of each section of the 20PP. The sections of the 20PP have been grouped into four logical themes of related topics, as illustrated on page 4.

The information is presented using illustrative diagrams, bullet point lists, pictures, etc, with the intention of raising awareness and stimulating interest on the part of the reader to then go on to read the relevant topics and techniques in more detail and as relevant to their particular role in Fleet Management. The document contains numerous good practice examples to illustrate the particular aspects of each section in the 20PP; in this concise guide, they are summarised in one brief sentence and indicated by a 'light bulb' symbol.

Although this concise guide covers all high level aspects of the 20PP, it is important to stress that the equivalent content within the 20PP itself should always be read to fully understand the topic concerned, as not all detailed information and nuances can possibly be included in this condensed version.

We hope that this condensed guide provides a fresh stimulus to the understanding and adoption of the 20PP to support the challenge of improving and maintaining excellence in fleet performance.

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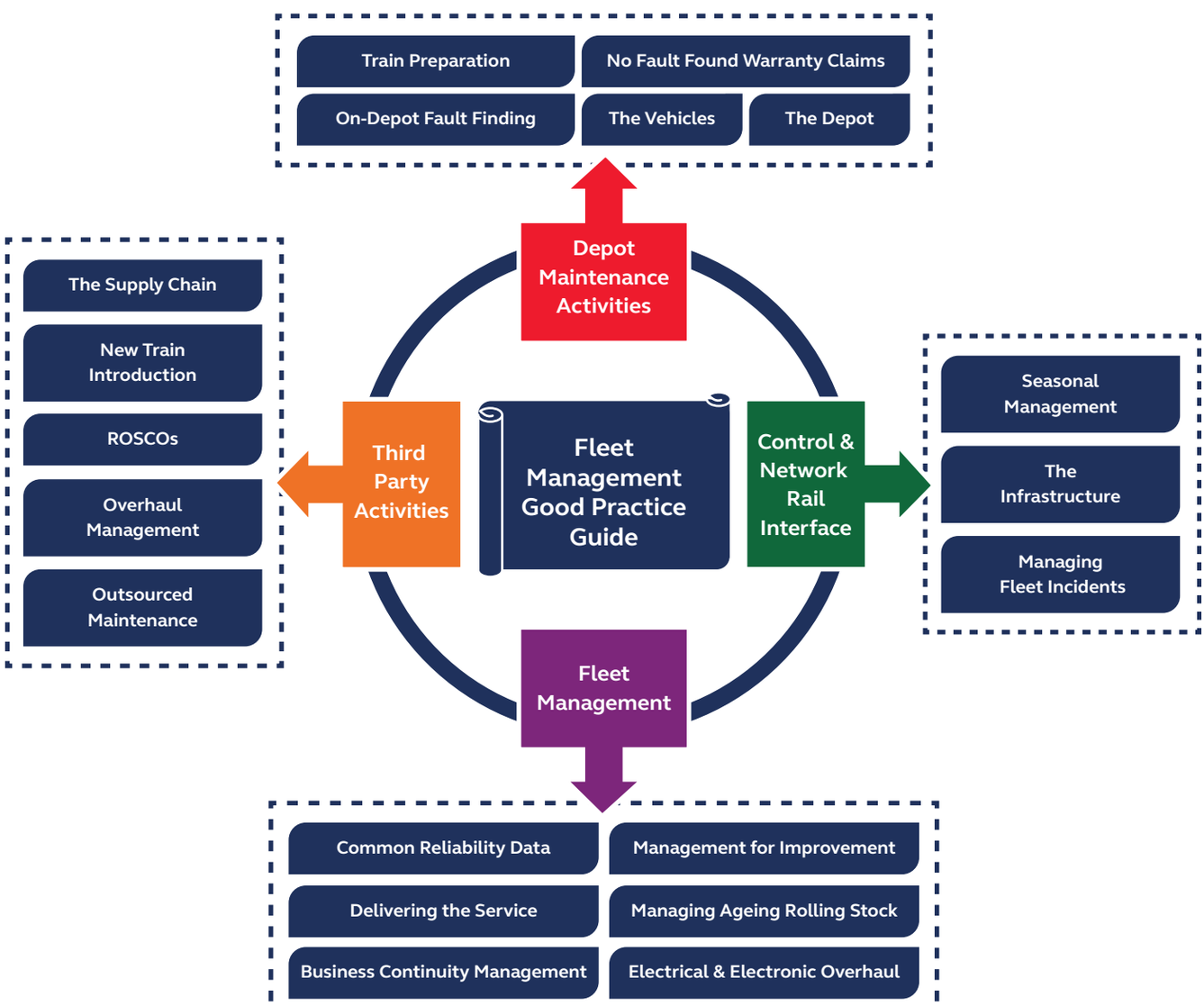
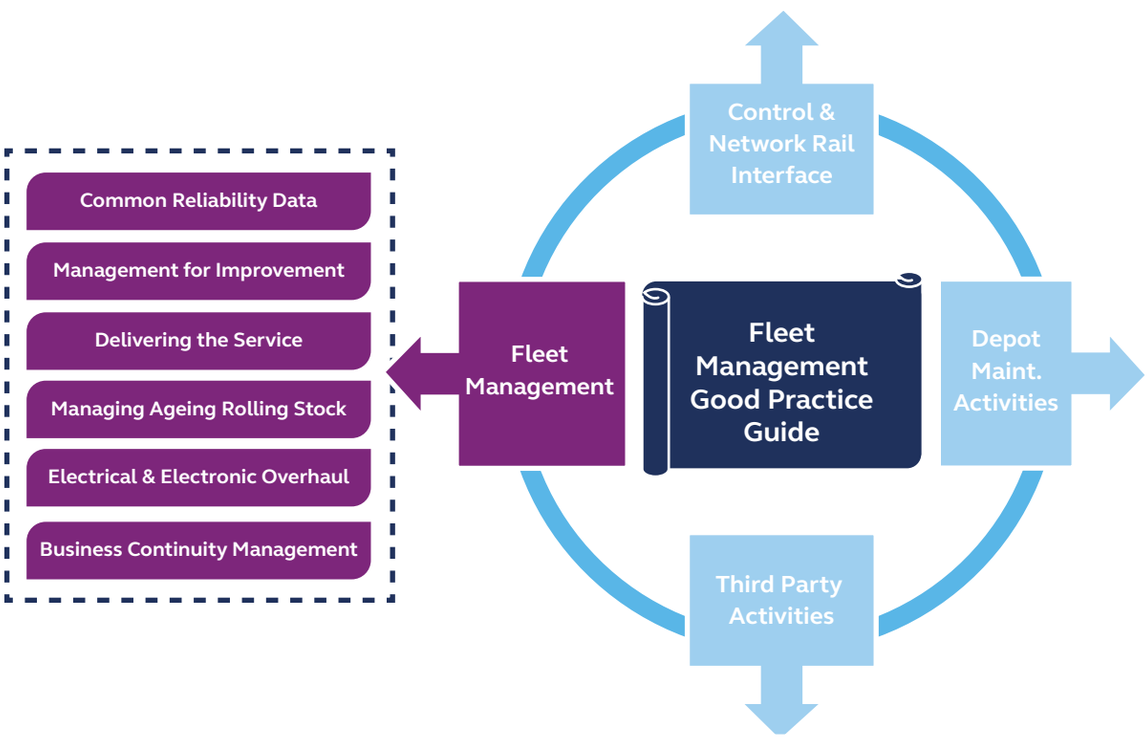
Fleet Management Good Practice Themes



1. Fleet Management

This section focuses on those activities undertaken by the fleet management function, both in terms of managing activities at the maintenance location(s) and dealing contractually with third party arrangements.



1. Fleet Management

1.1. 20PP Section 2: Common Reliability Data

The two key measures agreed by Engineering Council and reported by ReFocus are:

- Miles Per Technical TRUST Incident [Number] (MTIN), and
- Primary Delay Per Incident (Primary DPI)

The first is a measure of the **reliability** of fleet, the second is a measure of the effect of fleet failures on train delays. The underlying data for these two measures are provided to ReFocus at individual fleet level and reported back each industry period.

Miles per Technical TRUST Incident

DEFINITION

- MTIN is a measure of the engineering reliability of trains
- A Technical Trust Incident (TIN) is counted when a technical or maintenance defect on the train (fault) causes a total primary delay of 3 or more minutes at any point on one journey
- Any such incident which results in a cancellation or part cancellation is also included
- The measure is produced by RDG from data provided by TOCs (example shown in Table 3 of the 20PP)
- The operating TOC is accountable for fleet reporting to RDG

SOURCE OF UNDERLYING DATA

- Mileage is derived from actual fleet unit/trainset mileage as recorded in GEMINI or equivalent
- E.g. two 2-car 150/2 sets (say) working as one train count as two units and therefore its unit miles are twice the train miles
- Information is derived from TRUST, COMPASS, Control Logs and/or BUGLE

DETERMINING THE NUMBER OF TECHNICAL INCIDENTS

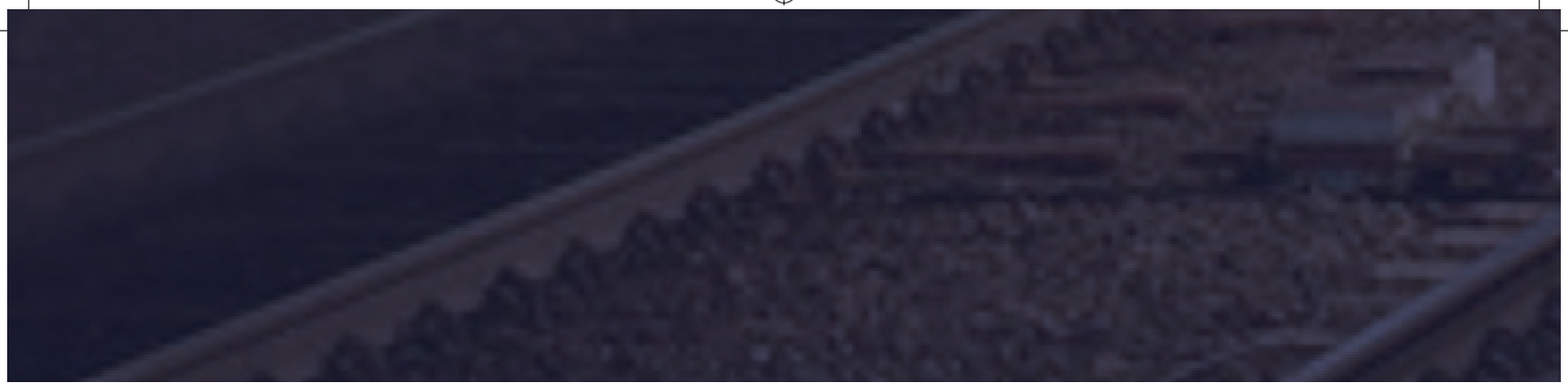
- Table 1 and Table 2 of the 20PP list the agreed technical and non-technical TRUST incident codes
- Table 1a provides an assimilation with the previously used codes
- The Delay Attribution Principles and Rules (DAPR)* is authorised for this information (available at www.delayattributionboard.co.uk)
- Clarification is provided on what should and what should **not** be included as a 3-minute incident, including non-technical incidents (e.g. depot delay)
- Clarification is also provided on **merging** incidents and dealing with No Fault Founds
- Guidance is provided on disputing incidents; a flow chart is provided in Appendix A of the 20PP

Delay Per Incident

DEFINITION

- Delay Per Incident (DPI) is a measure of the average delay impact on the network per incident
- Delay is the TOC-on-Self total (primary and reactionary) delay minutes of technical and non-technical fleet incidents
- Primary DPI measures primary delay only (if in doubt, consult the Delay Attribution Guide)
- Table 3 in the 20PP shows how this information should be reported

Fleet operators are required to submit the data by the end of week 2 (Friday) for **every vehicle** they operate. Data may be resubmitted/amended at RDG's discretion



REFOCUS DATA REVIEW PROTOCOL

- Common Reliability Data Audits will be performed on a sample of three TOCs per year, as agreed by Engineering Council
- Section 2.5 of the 20PP explains how this process is intended to work
- Any specific good practice or anonymised lessons learned from these audits will be highlighted to ReFocus and Engineering Council annually

1.2. 20PP Section 3: Management for Improvement

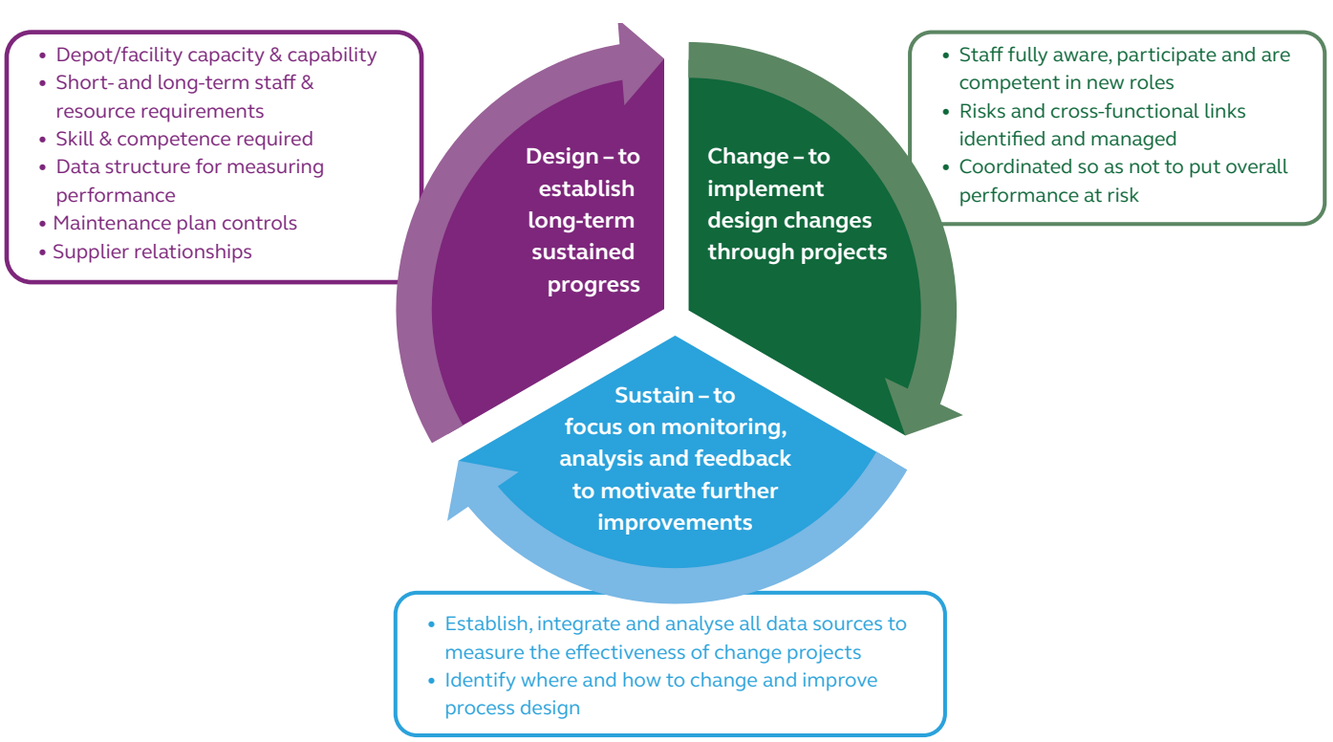
Principles

Franchise/contractual/regulatory obligations and business objectives should be used as the primary focus for developing initiatives.

Periodic review and feedback

Diligent day-to-day activities support the routine periodic review of operational performance and process KPIs. Periodic reviews should use quantitative evidence to verify that the design analysis of depot capacity, resource levels and production planning arrangements continues to be adequate. Results should be used to revisit underlying assumptions, assess the effectiveness of change projects and as a basis for further improvement projects.

Routine activities are performed within a designed environment **(see below)** and even the most competent frontline manager will be overwhelmed by over-optimistic availability targets, insufficient resources or inadequate depot capacity.



1. Fleet Management

Risk Evaluation

Engineering risk assessments should underpin the management process framework (led by business priorities) to inform decision-making and achieve timely and effective improvements.

The relationship between operational performance and the work undertaken on vehicles needs to be understood.

An example methodology is set out below, with a worked example shown in the 20PP:

Identify components

- All recognisable components, grouped into systems, e.g. brakes, doors, etc
- Systems can be complex (mix of mechanical, electrical, pneumatic, etc)
- Clear system boundaries and unambiguous function definitions
- All components required for each system to perform its specified function(s)

Analyse consequences

- Determine operational events resulting from failure
- Identify events that pose the greatest potential risk to operational safety and reliability
- RSSB 'Safety Risk Model' identifies failure scenarios
- A single outcome may arise from many potential root causes

Rank events

- Rank components according to the risk of failure leading to specific operational hazards and events
- A single point component failure leading to a catastrophic consequence → higher rank
- Combined degradation of several components leading to a minor hazard → lower rank

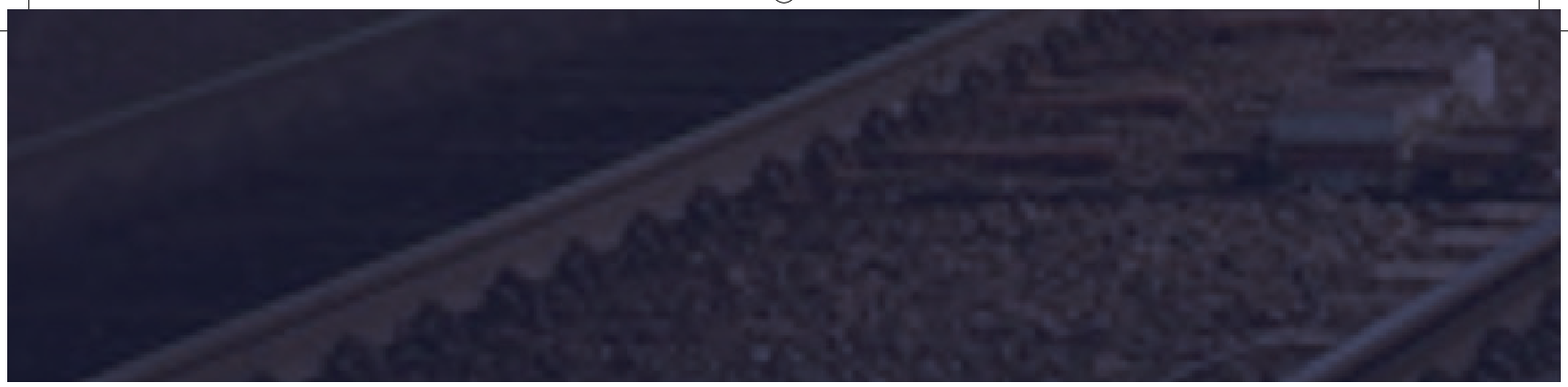
Maintenance plan review

- To identify possible omissions
- To rank all tasks in relation to their potential to affect the vehicle risk profile
- To identify the impact of internal and supply chain activities

Whatever method is used, the outcome should:

- Identify the most important maintenance tasks
- Review and restructure internal training/competence to minimise risks
- Inform decisions on the procurement of any maintenance and/or design services
- Motivate relationships with suppliers of services, especially overhauls and any contracted-out maintenance work
- Inform the analysis of engineering design changes

Note: The Railway Undertaking is ultimately accountable for controlling risks, whoever performs the work on the vehicle.



Day-to-day processes

Reliability is improved through sustained and rigorous attention to detail and compliance with published standards and specifications.

It is common knowledge that typically half of TOC fleet root causes are not pure technical reasons. The example shown in the 20PP showed 42% Confirmed Technical Fault and 11% maintenance 'own goals'.

Northern 'in-process' audits of equipment condition against maintenance standards to target poorly performing systems and components

Class 333 joint Northern Rail – Angel – Siemens group doubled reliability without any modification

Chiltern Aylesbury depot short diagrams for units with hard-to-identify faults

Other techniques:

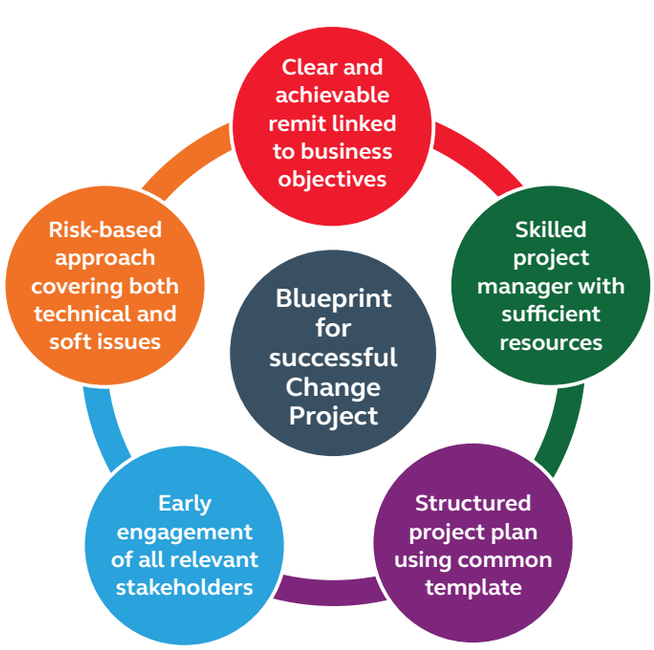
- **Contingency management** Significant, cost-effective improvements can be made through timetabling and clever use of the timetable
- **Redundancy management** includes feedback to understand whether levels are correctly set
- **Collective sharing** includes learning from others, pooling data, user groups, etc

Change management

Robust day-to-day management can be undermined by inadequate change processes.

Change projects should recognise the link between technical and process change, simplifying management controls and training requirements.

Siemens new Cl.350 trains supported by training technicians and drivers in Germany many months before start of service



1. Fleet Management

1.3. 20PP Section 6: Delivering The Service

This chapter examines how engineering, operational, planning and retail functions can work together to deliver a reliable service. These include both hard issues (e.g. interface rules set out in requirements documents); and soft issues (i.e. creating a culture of engineers and operators working together to optimise combined overall delivery).

Setting out some clear plans around hard issues is an essential step to consistently delivering reliability, as is having a culture of people who work together for optimum overall service delivery (e.g. departing from these plans in a controlled, mutually agreed way when this is the best thing to do).

Train service performance has been improved by:

- Focussing people on what is most important to themselves and their internal customers
- Creating indices by which progress can be monitored
- Providing more structure and formality around previously casual arrangements
- Improving cross-functional understanding and organisational learning
- Providing useful quantitative data to assist business cases to address root causes, improve resilience and make mitigations more effective

Co-ordination of depot and train planning (timetable and resources)

Resilient, joined-up plan for reliable service delivery

- Some train operators co-locate depot and train planning teams; others have an engineering planner who sits on the train planning group
- Train planners need to understand depot capacity and the realistically deliverable fleet availability levels
- Train and depot planners regular meetings (especially around timetable changes) to review experience and respond to short term alterations (e.g. engineering work)

GWR joint engineering operations diagramming workshop

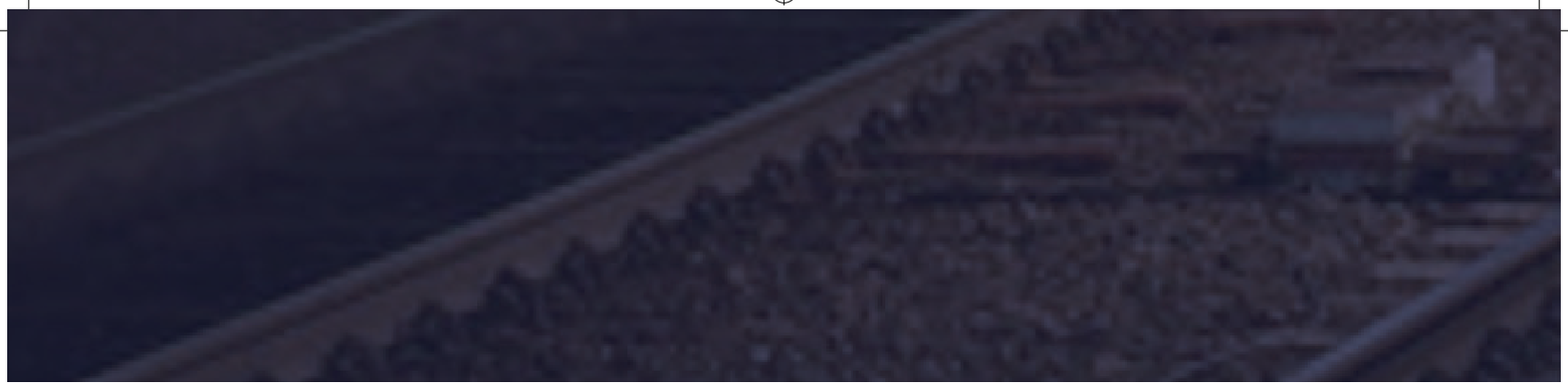
SWR minimise coupling/uncoupling of units → increased fleet mileage but reduced risk of failures

Best practice in managing the plan

- Costs/risks vs benefits analysis for planned changes (timetable change, diagramming alterations, etc)
- Focus on ability to ***reliably*** deliver the service and also the ability to deliver service quality (e.g. turnaround/ downtimes for adequate cleaning, toilet emptying, etc)
- Feedback loops to monitor the delivery of the plan throughout the day (not just the 6am stop position) → effort (and resources) can then be directed where they will have most effect

TfW Rail Production Manager daily 'traffic light' report direct to Operations colleagues

C2C's station fitter at Shoeburyness to reduce service risk from coupling/ uncoupling



Best practice: go beyond the safety baseline required in a standard contingency plan.

Cut-and-run policy: how long (and indeed whether) to support the driver in fault-finding.

Encourage timely/useful failure/fault info from drivers:

- Write to driver, thanking them for their report
- Explain what was found, what was repaired
- Suggest useful mitigation if it should occur again

The fitter needs to know what it feels like to be at the front of a broken train full of hundreds of people wanting to get home.

Computer-based fault chart at maintenance control centre to assist drivers and record details

Use of train-depot communications to 'dial up' the train in real time to investigate faults

For any one driver, train faults will actually be quite rare.

- Might need support to work through an otherwise common fault
- Might need support to deal with incidents where they are on their own in the cab and under pressure

The driver needs to understand that it's very hard to find (let alone fix) a fault with little or no information about the failure.

SWR 'Phone a Friend' (a dedicated helpline for defect reporting and support)

SER fault reporting training for drivers, using simulators

Remote location in a low traffic density area → driver to phone nominated maintenance contact for advice, allowing the train to proceed, possibly in a controlled degraded mode.

Same fault on the approach to a busy station at a peak time → declare the train an operational failure and clear the line.

Other good practices:

- A newsletter for drivers to promote understanding, focusing on topics that are known to be of interest to drivers, e.g. defect reports, driver managers or after attending driver briefings
- An engineering slot in the drivers' safety update briefing enabling face-to-face, two-way discussion of current issues and future developments

EMT coupling video ('The Happy Coupler') using own trains and staff

1. Fleet Management

Measures of fleet performance (and how they are used to improve performance)

Agree a joint data set for measuring fleet performance

Seek to avoid the scenario whereby different functions/departments measure and analyse performance data differently.

Requires mutual trust and understanding between different departments and areas of expertise.

LNER fault-specific projects prevent or mitigate effects of failures

C2C one-page 'Service Affecting Incidents' fault/failure data discussed at joint fleet/ops. performance meetings

Work together with the agreed dataset and root causes

Look for short-term operational mitigations whilst longer-term engineering fix is developed and implemented.

Capture faults that do not yet affect the service but reduce operational flexibility.

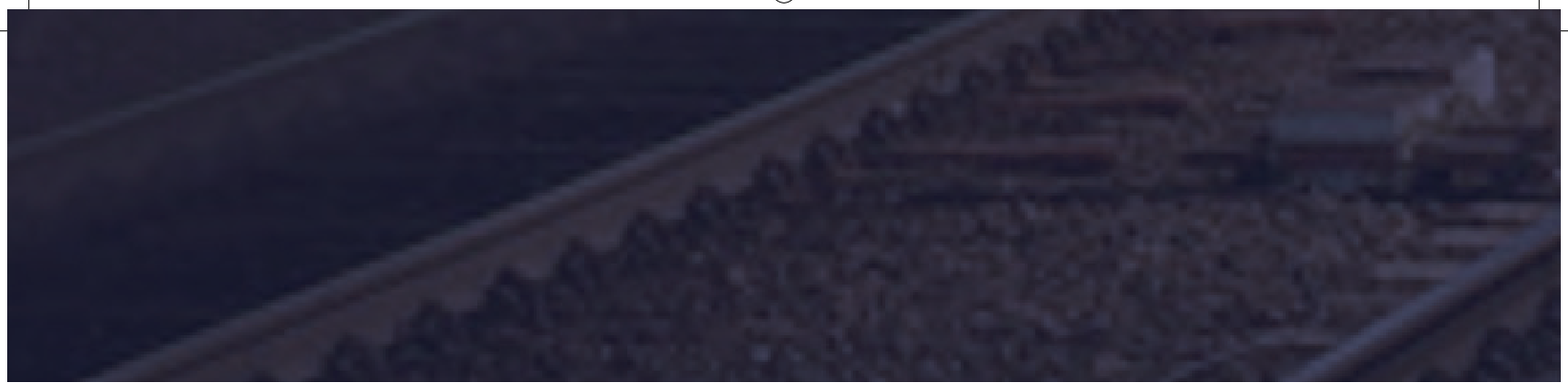
C2C measure trends in degraded mode operations where one cab has to be buried

Drivers agreed to use the saloon doors to access the cab when changing ends pending technical improvement to cab exterior doors

Focus on fleet performance initiatives that will have the most impact per pound spent

More is better: Expand the definition of 'fault' to include actual and ***potential failures***. This can include service quality issues (e.g. cleanliness, functional toilets, etc).

Fewer is better too: Jointly examine and understand the worst incidents in each period. Such reviews can identify wider, longer-term opportunities for improvement.

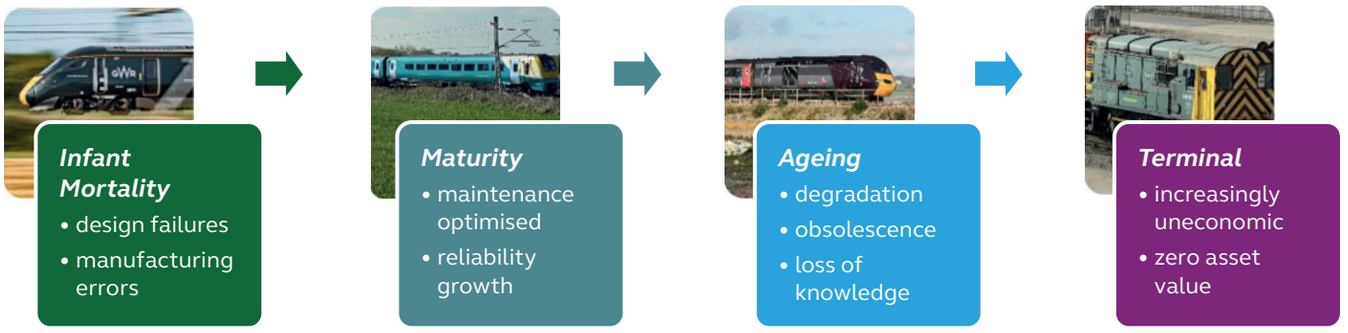


1.4. 20PP Section 10: Managing Ageing Rolling Stock

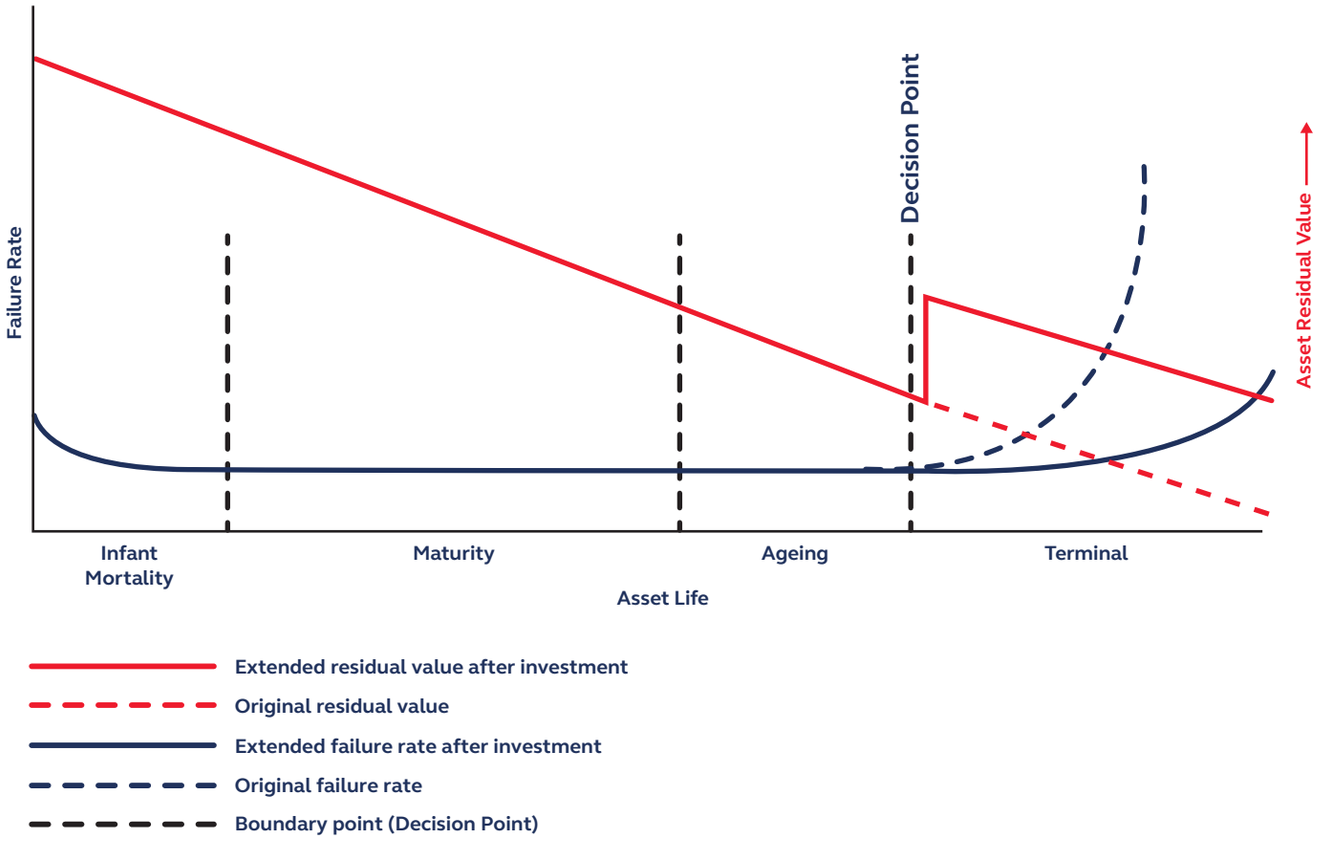
All rolling stock has a predicted design life, where the fleets are expected to operate reliably and economically. Towards the latter end of their life, key decisions need to be made to manage vehicles in such a way so as not to adversely affect performance and reliability.

Rolling Stock Design Life

The 'bathtub curve' process model is regularly used to show the phases of asset service life:



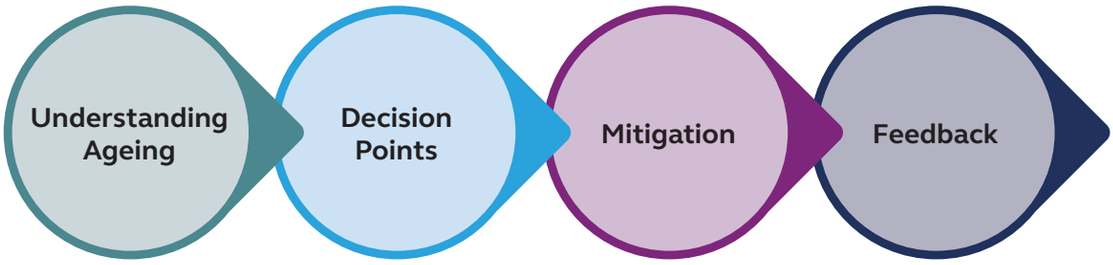
The 'bathtub curve' diagram below illustrates that reinvesting at the right time will increase the rolling stock residual value; this in effect extends the maturity stage and time in operation.



1. Fleet Management

Ageing Management Process

Mitigating the ageing process (the third phase of the 'bath tub' curve) is categorised into four good practice stages:



- Problems
- Signs
- Condition assessment

- Internal
- External

- Hard landing
- Soft landing

- Is the process working?

3.1: Understanding Ageing

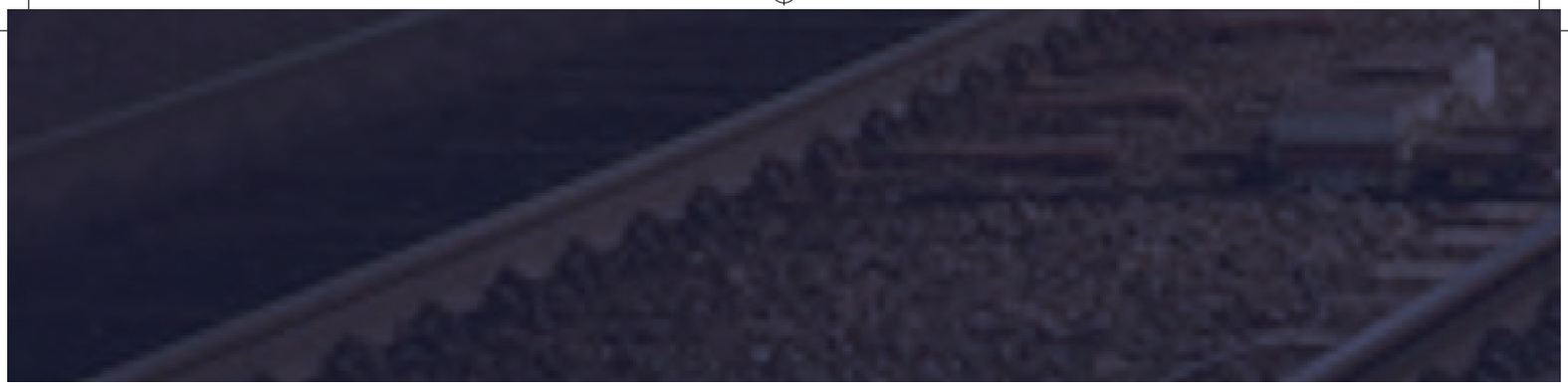
- Reliability and performance increasing affected by age-related degradation and obsolescence
- Historical performance, reliability, maintenance and overhaul data vital to understanding the effects
- 20PP has a flow diagram for reacting to age-related defects and critical parts
- Main issues are corrosion, fatigue and obsolescence; 20PP has a summary of these and other generic issues associated with ageing
- 20PP has a summary of these and other generic issues associated with ageing

3.2: Decision Points

- New operating contracts (or cascade to another TOC) – any plans to accept or manage ageing rolling stock should be scrutinised for economic viability
- Electrification and decarbonisation – the Department for Transport (DfT) programme for Net Zero Carbon railway should be considered
- New legislation – is it economically viable for ageing stock to be enhanced to be compliant
- Economic viability – how much life is left in the rolling stock? Does it justify life extension, refurbishment or other investment?
- Stakeholder expectations – the stigma of 'old trains' vs those with digital displays, Wi-Fi, power sockets, etc

Life extension option of Cl. 317s limited (as an AC EMU) vs a fleet such as the Cl. 170s, which are network wide

Comprehensive Cl. 168 or HST refurbishments, where many customers believed these were brand new trains



3.3: Intervention and Mitigation

- Strategy needs to be informed by hard data related to asset condition, together with risk analysis, condition assessment, etc
- The 20PP contains a simple system tracker for monitoring the condition of critical components and systems. Decision required as to whether the rolling stock continues in service, is repurposed, repaired, enhanced ('soft landing') or scrapped ('hard landing')
- Decision required as to whether the rolling stock continues in service, is repurposed, repaired, enhanced ('soft landing') or scrapped ('hard landing')

Soft landing Rolling Stock has the option of life extension or cascade and may remain in service.

- Use asset condition data/information to determine the exact maintenance regime
- Proactive repairs to combat the effects of fatigue & corrosion
- Adjust maintenance intervention to account for reduced use but continued degradation e.g. rubber components
- Any cascade/transfer plans supported by strategic planning to maintain current performance and reliability
- Retirement of experienced staff can take their knowledge with them
- Document lessons learned from successes ('Why did it go well?') and failures ('What did not work properly and why?')
- Positive culture through staff engagement and communication to maintain commitment to the continued care of ageing rolling stock and counter tendency to tolerate failures and poor reliability
- Encourage innovative suggestions to solve reliability issues/make improvements
- Any modifications or configuration changes reflected in the VMI

Hard landing Rolling Stock approaching the end of its life without life extension or cascade.

- All previous planned/scheduled heavy maintenance changed to light maintenance to save costs
- A risk-based approach to descope overhaul activity, skipping some tasks, repairing instead of replacing components, recycling spare parts from out-of-service units
- Prioritising units with lower mileage in service

3.4: Feedback

- Use recognised KPIs such as MTINs and asset current condition to evaluate effectiveness of chosen strategy and supporting management programme
- Adjust the programme as required to take into account latest information on ageing signs, safety issues, etc
- Maintenance strategy should be reassessed if mitigation is not effectively addressing the effects of ageing or poor performance and reliability

1. Fleet Management

1.5. 20PP Section 11: Electrical & Electronic Overhaul

The guidelines in this section are intended to promote a structured approach to electrical and electronic systems overhaul. The section is categorised into four subsections to make good practice easy to adopt according to individual business needs:

1. Planning and Specifying Contracts and Scope of Overhauls

Overhauls for electrical and electronic equipment are notoriously difficult to specify – equipment often ends up being subject to a 'fit and forget' approach which can then result in 'change upon failure'.

It is worth investing the effort in planning and specifying overhauls for mission-critical systems, especially when there is a significant increase in No Fault Found (NFF) defects

Good Practice for electrical and electronic equipment overhaul contracts

Get an accurate picture to optimise the overhaul scope

- Understand the in-service duty cycle: what is actually experienced by the component
- Understand previous repairs done
- Failure info: systematically capture relevant data, focus on actual defects, analyse back to root cause, understand interactions with related systems

Draw up contracts based on component information

- Well-defined interfaces and expertise requirements
- Performance benchmark with achievable criteria to monitor electrical component reliability
- Rigorous testing to replicate real operating conditions

Eversholt/SET Cl. 465 Traction Equipment Replacement Project → only two equipment failures in 10 years

Plan to efficiently deliver an overhaul that lasts

- Consider the spares float, e.g. sufficient to support overhaul/future needs or requires injection/reverse engineering?
- Assess obsolescence threats, e.g. critical sub-component risk review
- Future-proofing, e.g. opportunities to increase redundancy, improve fault handling analytics?

VTEC Class 91 and Mk4 fleet FDM racks reliability investigations and overhaul programme → 85% reduction in failure rate

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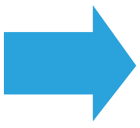
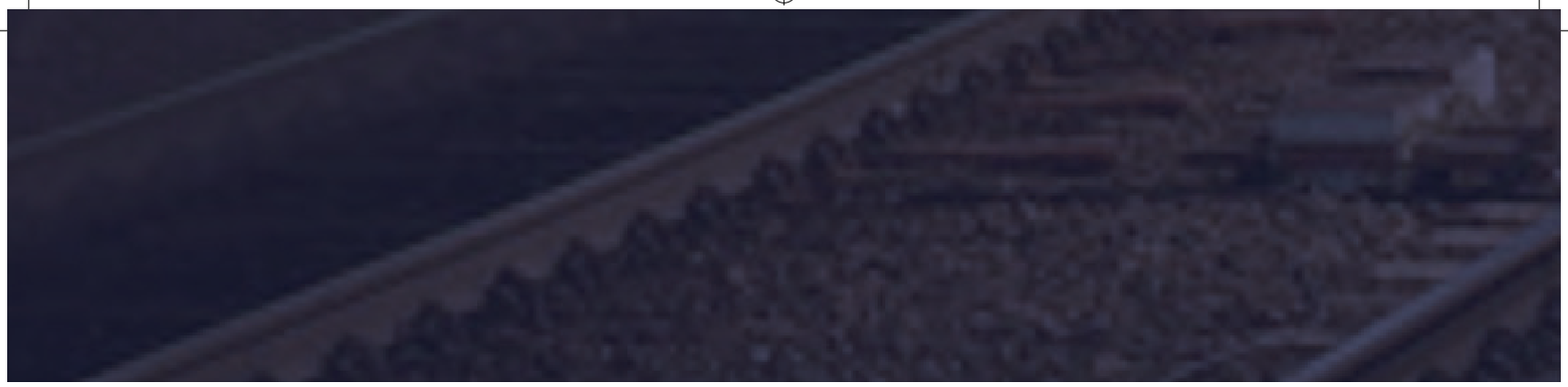


Select an overhauler with sufficient real expertise and interest in the particular equipment and/or underlying technology.

Many UK electronics repair companies are not necessarily focused on railways, but can bring fresh thinking based on real, relevant expertise and deliver solutions to previously 'insoluble' rail vehicle component problems.

Southern Mk1 WSP Racks reliability improvement using a new repairer (Servotech) who specialised in electronic obsolescence



2. Sharing information along repair/overhaul/mod supply chains

Long term contracts with benefit-sharing mechanisms:

- Profit securement schemes, e.g. 'cost plus'
- Targeted pricing, e.g. 'baseline and vary'
- Incentivising KPIs aligned to both TOC and supplier business models, e.g. MTIN

Consider embedding personnel/swapping roles:

- Enhance understanding of different priorities to mutual benefit
- Dedicated resource can aid information flows
- OEM staff and TOC technical support staff to work together on the depot (where practical)

Porterbrook Customer Liaison Manager at Unipart to resolve issues affecting material supply

Share information through User Groups (and ReFocus):

- Seek dialogue directly between TOCs, ROSCOs and repairers
- Share emerging obsolescence and reliability issues promptly through User groups
- Streamline and share solutions development
- Prevent float crises and minimise reliability hits

Class 15x User group identified the preferred technical solution to the unreliable charging system start-up (magamps) issue

Fault investigation techniques

- Capture evidence via component logs, in-service videos to share with the supplier
- Component fault logs should be retained (i.e. not wiped) for review by overhaulers

WMT Cl. 170s Door Control Units Joint investigations into root cause using fault logs and video evidence halved component usage

3. Systematic Identification of Root Cause – Frontline Maintenance

The success of tackling intermittent faults/NFF for increasingly complex electronic systems is increased by identifying and capturing relevant information from operational circumstances and using it systematically

Data gathering

- Download component and TMS logs at the time of any alleged fault
- Exchange information with OEMs/overhaulers and work together to determine and fix root cause

Use reliability 'Level Checks' particularly after NFF. For example:

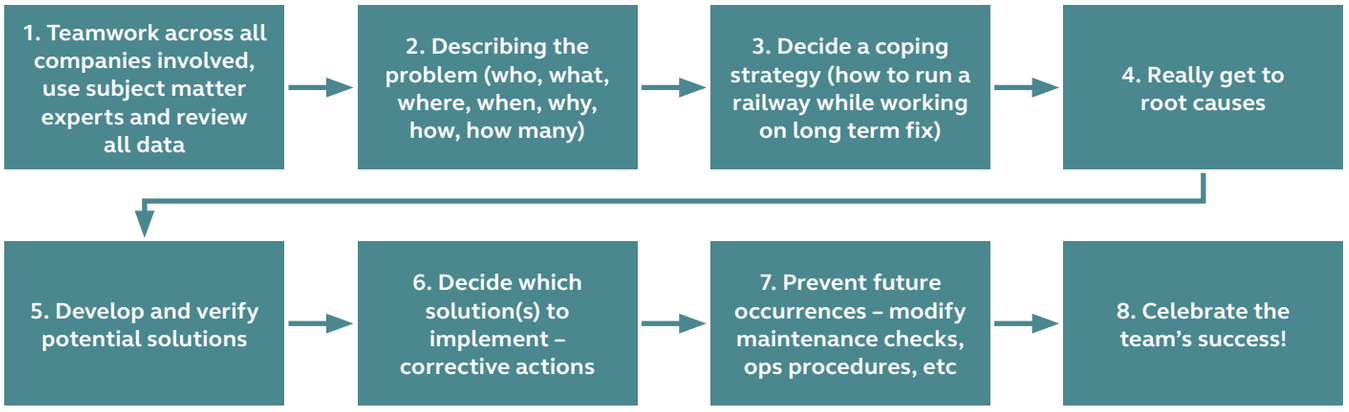
- Level 1 – Download fault logs, reviewing data and testing key outputs in situ
- Level 2 – Change (traceably swap) a known, problematic component (most likely/least expensive/easiest to change), bench-test or send away for repair
- Level 3 – Checking for findings on the component(s) changed/swapped at Level 2; if still NFF do something else, escalate to technical investigation

Include downloading requirements and checklists in VMI, tailored to failure types

1. Fleet Management

4 Systematic Identification of Root Cause – Technical Investigation

Industry-standard investigation techniques include the 8 disciplines of problem-solving which sets out a structured approach worth adopting:



Step 4 can be challenging: increasingly, electronics and electrical systems interact to cause intermittent and transient symptoms which are difficult to replicate in the maintenance environment. 20PP has an Ishikawa (fishbone) diagram to support teams exploring potential root causes.

Best Practice Principles

Consider deploying bespoke investigative RCM (iRCM) (e.g. 'data loggers') where faults are intermittent/ transient and symptoms hard to link to root cause.

Mid-life fleets can benefit from selectively retrofitting Remote Condition Monitoring (RCM) to enable systematic identification (and resolution) of long-term root causes.

A typical RCM investigation needs to be specified carefully to add value, based on:

- Establishing the fault symptoms to investigate, based on historic failures and actions taken
- Understanding the system so responses under various conditions can be modelled

Once specified, the data analyser needs to be designed and configured to capture each system/sub-system state in enough detail for states to be correlated with fault symptoms.

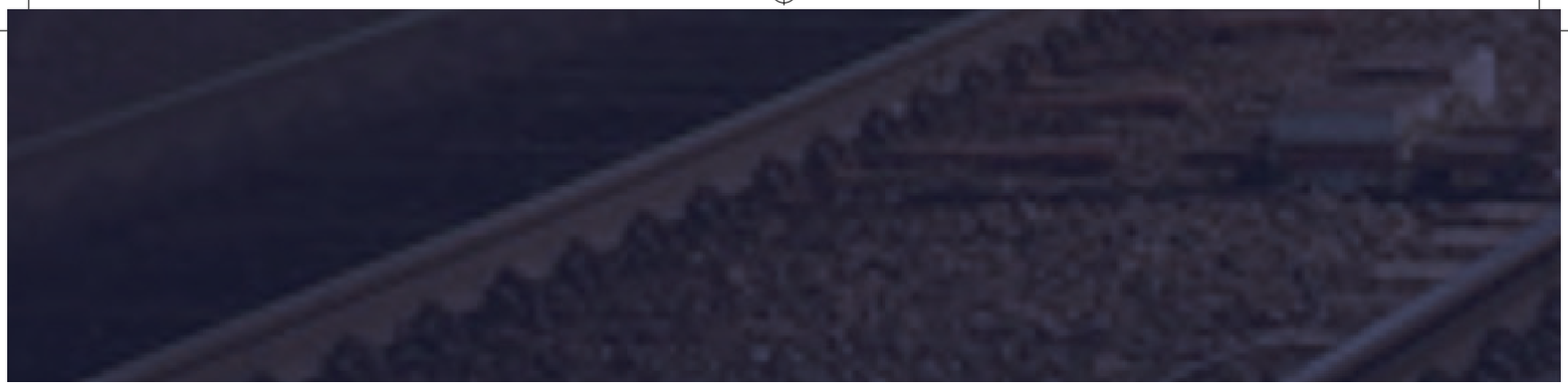
RCM can continue to add value even when a fault is found and resolved:

- Can inform future predictive maintenance
- May uncover fundamental design issues, requiring upgrade rather than overhaul
- Use to developing Predictive Maintenance to identify requirements for any fleet-wide changes, overhaul or enhancements

Investigative RCM follows the structured frontline maintenance processes, effectively the Level 4 Check when faults aren't found, and the symptoms continue to arise.

RCM may need a significant amount of work and likely to be applied to the most intractable problems, when all the obvious potential solutions have failed.

Investigative RCM on SET Electrostar challenged the 'replace the AVR' default response to power generation symptoms and showed that complex sub-system interactions were at work

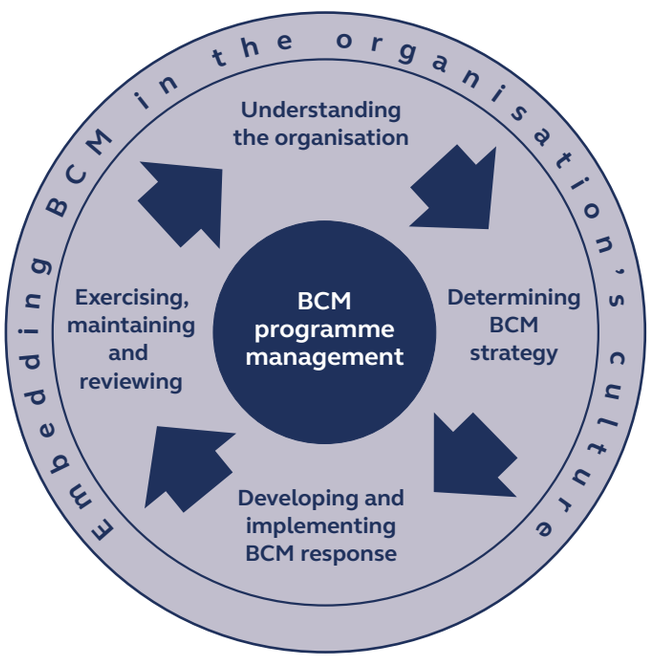


1.6. 20PP Section 20: Business Continuity Management

Business continuity is the strategic and tactical capability of the organisation to plan for and respond to incidents and business disruptions in order to continue operations at an acceptable/agreed level.

Business continuity management (BCM) follows a cyclical process of analysis to understand threats and requirements, determine and implement contingency strategies and validate planned response through testing and exercising. This is illustrated in the diagram opposite.

The buy-in of top management and key staff, together with agreed budget and timelines, are essential to success. Against each of the four stages of the cycle, the following best practice activities are:



BSI BS25999 life cycle

Understanding the organisation	*Determining BCM strategy*	*Developing and implementing the BCM response*	*Exercising, maintaining and reviewing*
• The risk analysis process • The business impact analysis	• Definition of scope • Business continuity policy • Policies for establishing, maintaining and reviewing plans	• The incident response structure • The plan • Key tasks and reference information • Details of the organisation's media response	• Maintaining and reviewing plans • Corrective and preventative measures • Management review • Audit

The following key activities are highlighted

The business impact analysis (BIA) Define the criticality of the TOC's activities that support the services and the resouces associated with these activities:

- Identify services and departments defined in the BCM scope
- Define the impact of activity disruption and therefore acceptable period of activity disruption
- Define all resource dependencies (location, staff, IT support, technology, etc.)
- Define the minimum resources required to recommence activity over time
- Define acceptable recovery times for each resource on which the activities depend

This analysis is vital to understanding the structure of the BCM programme and should be assigned due priority and time accordingly.

1. Fleet Management

Incident Response

Each team within the incident response structure should have a plan. Typically, organisations will follow a three-tier gold (strategic), silver (tactical) and bronze (operational) command structure. All teams should have trained executive support.

The structure should identify processes to confirm the nature and extent of an incident and trigger an appropriate BC response, including resources and communication with stakeholders.

The roles of these teams are:

Gold (Strategic)

- Overall incident management
- Setting strategic aims & objectives
- Media
- Communications & liaison (internal/key stakeholders)
- Resolve Silver/tactical-level resource issues
- Plan for recovery

Silver (Tactical)

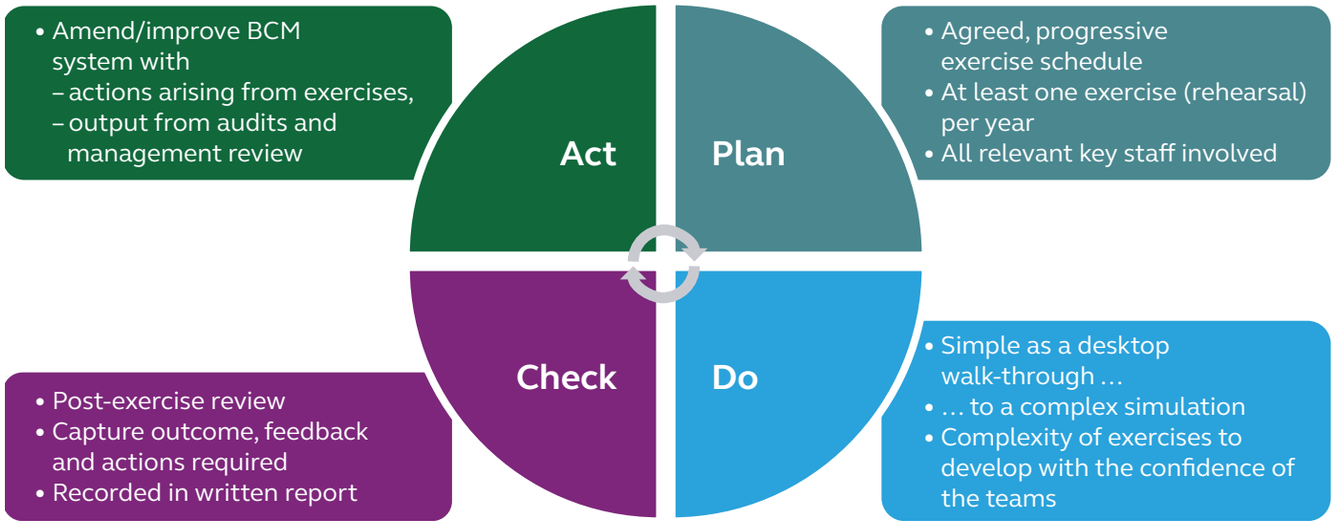
- Assess risks
- Allocate and manage resources to achieve strategic aims/objectives
- Plan and co-ordinate operational activity
- Communications & liaison (internal/key stakeholders)
- Resolve/escalate Bronze/operational-level resource issues

Bronze (Operational)

- Undertake tasks and activities as directed by Silver
- Escalate resource constraints to Silver
- Communications & liaison (largely internal)

This structure should be documented in useable plans, readily available to all response teams.

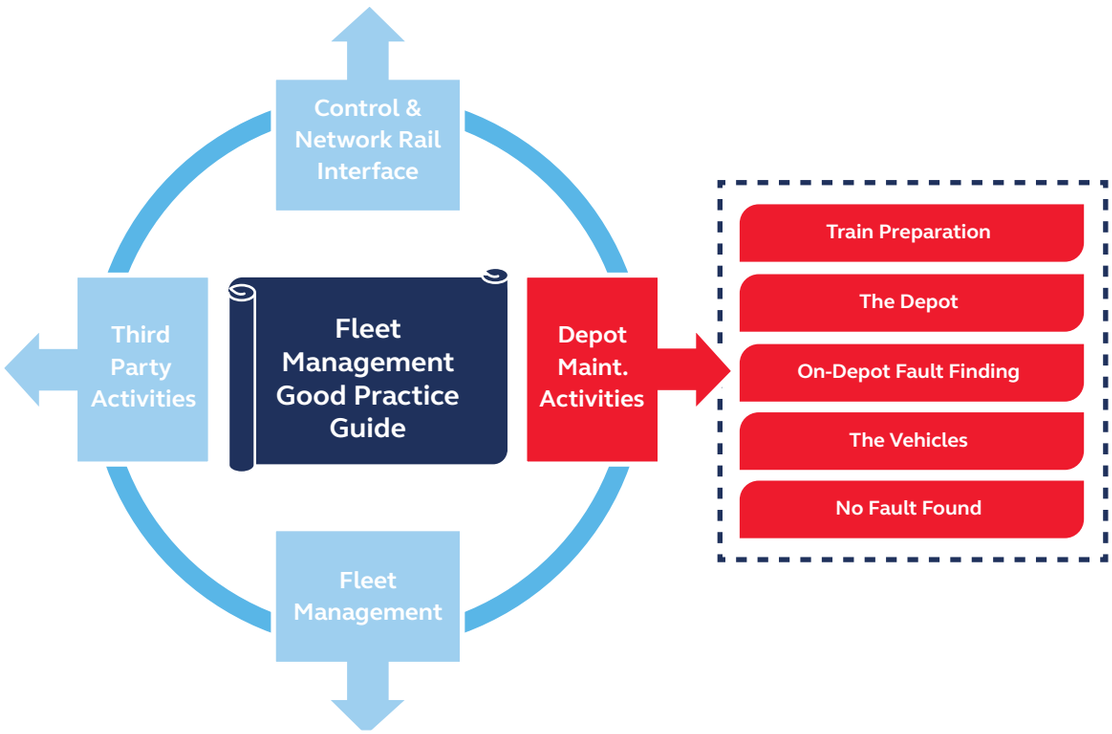
Maintaining and reviewing plans



The reputation of the organisation is under close scrutiny in the aftermath of an incident; the ability to respond is significantly improved by a structured business continuity programme.

2. Depot Maintenance Activities

This section focuses on those activities undertaken by depot maintenance staff, typically at a dedicated maintenance facility. No matter what overall plans and fleet strategies are in place, good practice in depot maintenance activities, whether part of a planned maintenance cycle or repairs due to defects in traffic, is key to good fleet performance.



2. Depot Maintenance Activities

2.1. 20PP Section 5: Train Preparation (TP)

Analysis of TP failures can identify most frequently recurring failures and understand the systemic issues; this can include comparison of failures which occur on depot compared to those which occur at outstations. Feedback into periodic updating of TP content/arrangements and link to fault finding.

WHO — Drivers or Maintenance staff?

- Good practice: train prep. by maintenance staff, confirmed to driver by receipt of formal documentation → take train into service
- This arrangement may not be possible at all locations; each train type/location dictate who is best placed to carry out TP
- Consistency of approach – sometimes different arrangements can evolve for different fleets based at the same depot

London Midland enhanced fuel point exams

WHERE — Depot or out-based locations?

- Depots may have limited berths → Risk of congestion if too many trains on depot
- Outstation TP can be less effective, e.g. limited 'walk round' access at stabling points

Hornsey depot staff undertake TP; at outstations, traincrew undertake TP

WHAT — Content of TP

- Little or no requirement to test horns, head, tail and marker lights
- Splitting already coupled units to test coupler introduces risk
- Intermediate cab checking is considered good practice
- TP should not be used as a maintenance/cleaning 'finished work inspection'

WHEN — Frequency/validity of TP

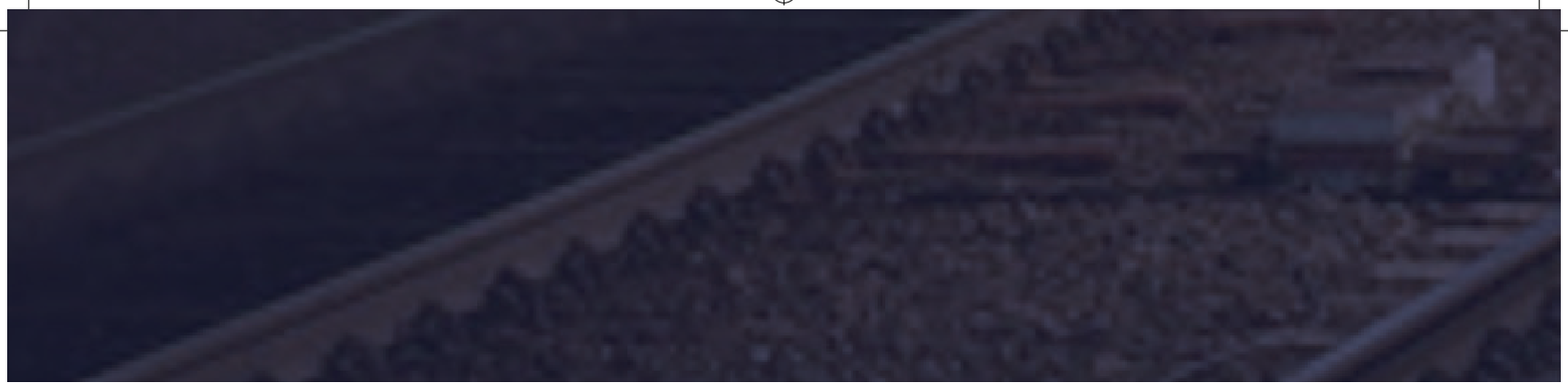
- Good practice would be for train preparation to be valid for at least 24 hours
- Consideration should be given to whether the TP periodicity can be extended to make better use of staff resources
- New rolling stock introduction is a good opportunity to review TP processes and 'start again'

Class 390 fleet 24 hour preparation validity

HOW — Make use of technology

- Use of modern TMS and Automatic Vehicle Inspection Systems (AVIS), to enhance, increase efficiency of TP
- System 'self test' at start-up (Auto prep) can reduce manual TP but has to be reliable

Electrostar TMS Intelligent Display Unit used by fitting staff



2.2. 20PP Section 7: The Depot

This section examines the depot in terms of the physical infrastructure, facilities, etc and the personnel employed who work there.

Many depots are established and there may not be capital available within the franchise model to undertake major redevelopment … but:

Capacity Delivery of the Depot

- Monitor using appropriate KPIs, e.g.
  - deferred work level
  - average number of vehicle moves around the site
  - berth occupancy percentage in maintenance shed
  - late starts off depot by cause
- Identify need for change but also opportunities to create and exploit spare capacity
- Depot should not be a dumping ground for operational convenience

SWR fleet staff in Operations Control optimise units on depot

Light and Heavy Maintenance

- Optimise units on the depot for efficiency of required light maintenance programme
- Heavy maintenance in-house can be good for 'ownership' of reliability but needs to be properly resourced and planned

Neville Hill depot developed bespoke computer programme to optimise depot throughput

Maintenance Work Planning

- Detailed depot maintenance work planning can optimise use of the depot, its people and facilities
- Not just the number/type of vehicle berths and equipment
  - progression of vehicles through the facility
  - sequencing of work and vehicle downtimes
  - team structure and working methods
- Aim for proactive, rather than reactive organisation (it's harder to identify root causes critical to improving reliability whilst resolving the depot's latest emergency)

GWR inspection measuring and test equipment at point of use to improve depot efficiency

Central Rivers exam work grouped into powered down, powered up and work arising

RSSB Guidance Note for the Development and Design Considerations of Passenger Rolling Stock Depots **(GIGN7621)** sets out considerations which seek to support the commissioning of a useful and operationally efficient depot.

2. Depot Maintenance Activities

Depot best practice in Human Resources (staff motivation and skills)

Northern depot staff quality improvement techniques training

Focussed training

- Based on vehicle/train risk assessment model
- Training materials aligned to VMI content and quality system techniques
- Prioritise competence assessment on tasks that most influence safety and reliability

SWR 'Don't dabble with doors at outstations'

Human factors

- Recognise anti-social working hours, awkward conditions, etc
- Soft skills vs technical skills
- Foster ownership of fleet performance (war rooms, daily team meetings)

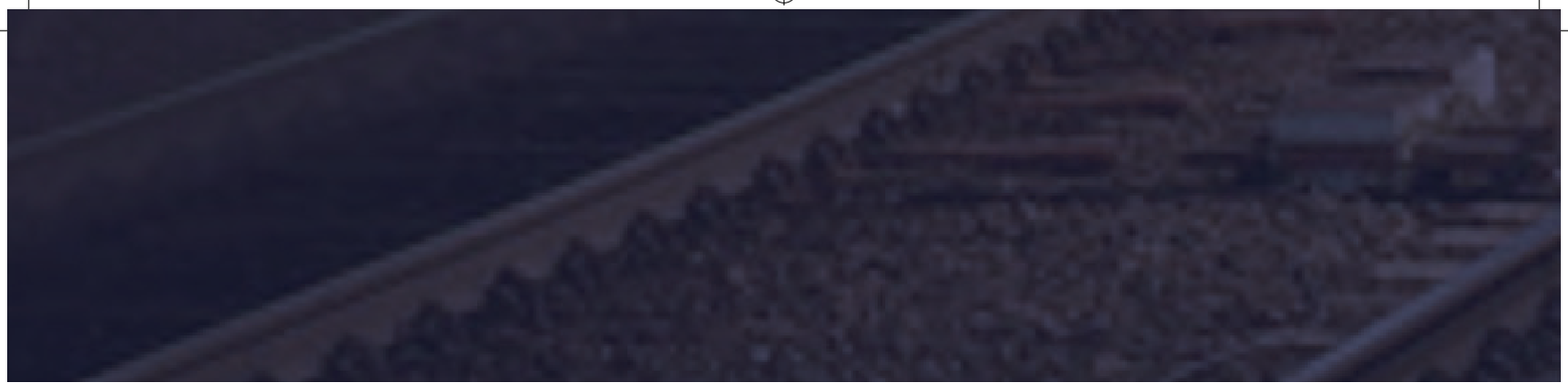
Techniques

- Quality processes (Lean, Kaizen, 6-sigma, etc)
- Specialise on key systems, e.g. traction, doors, software
- Identify fault-finder specialists versus routine exam workers
- Mentoring for new people

EMT Class 153/156 refurbishment programme staff input

Longsight depot Kaizen Promotion Manager and Technician

Staffing levels must be sufficient to enable and sustain long-term reliability growth.



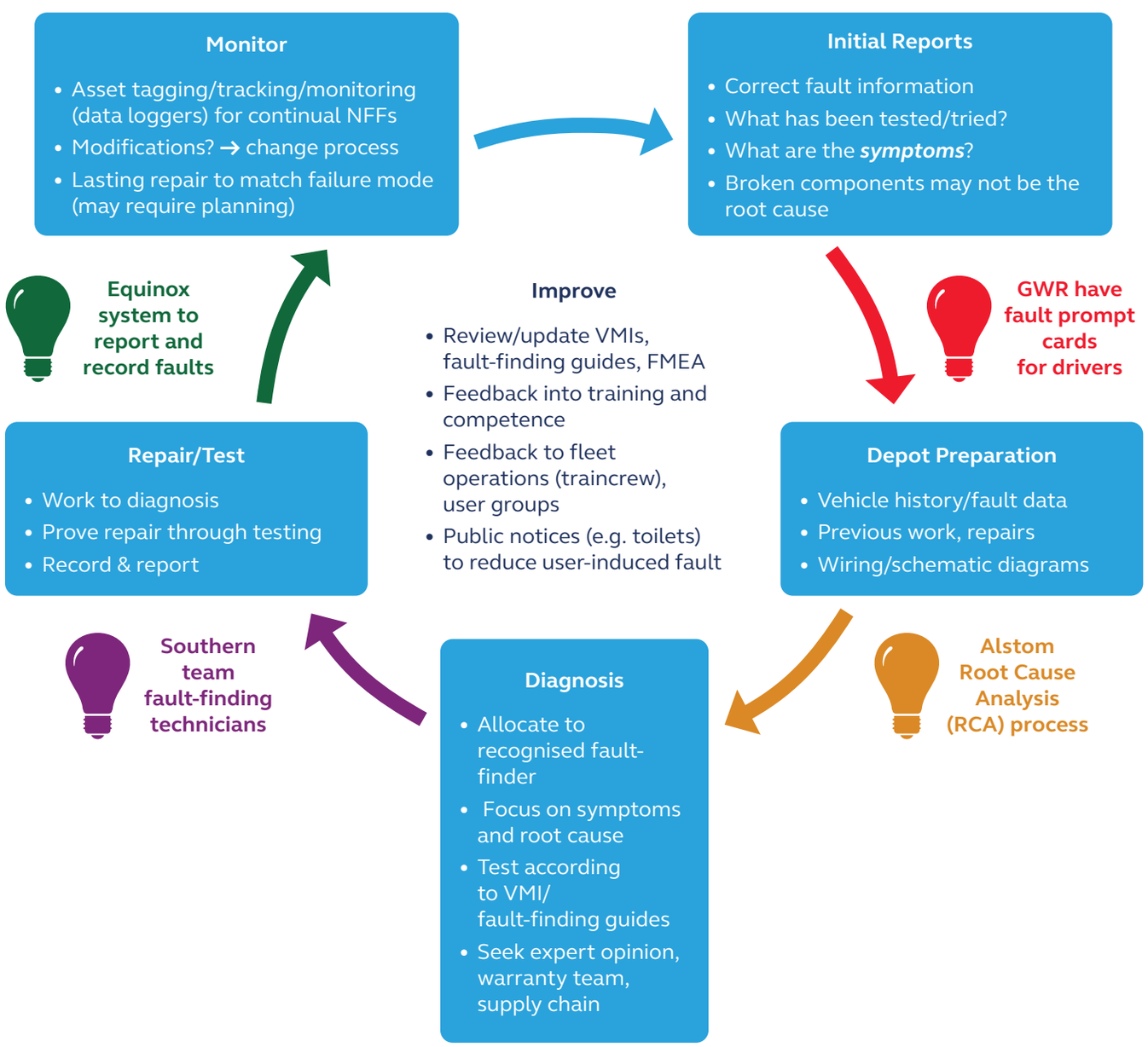
2.3. 20PP Section 8: On-Depot Fault-Finding

This section explores good practice for on-depot fault-finding, seeking to challenge the malaise of 'No Fault Found'. It focusses on the role of the fault-finder, including the identification, training and development of such staff.

Standardised fault-finding chart

A fusion of the problem solving principles within the OODA (Observe, Orientate, Decide, Act) and DMAIC (Define, Measure, Analyse, Improve, Control) loop models.

Fault-finding chart



2. Depot Maintenance Activities

The Role of the Fault-finder

- Recognise as a specialised activity
- Better suited to those who enjoy a challenge

Technical skills

- Experience of complex systems engineering
- Good electrical/mechanical systems knowledge
- Computing skills
- Operational empathy
- Knowledge transfer (to avoid single point expertise)
- Increasing need for IT/software skills for newer trains
- Use/develop depot testing equipment (to avoid cost of returning components to supplier)

Soft skills

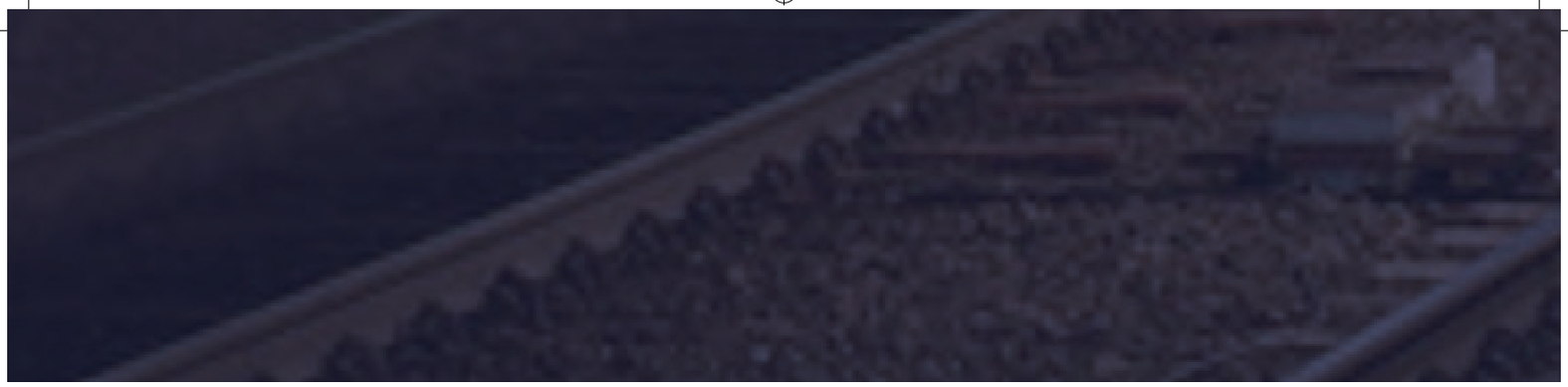
- Work as part of or support a maintenance team
- Ability to explain technical subject
- Confident, challenge the status quo
- Inquisitive by nature
- Disciplined, methodical

Training and development

- Different training methods (e.g. simulators)
- Link to recognised engineering qualifications
- Mix of in-house vs external training

Depot management teams should consider how many fault-finders are required and ensure an even spread amongst shift teams.

Alstom Level 3 train systems (traction, AWS, HVAC, etc.) training programme



2.4. 20PP Section 9: The Vehicles

This section considers strategies for maintenance and repair of the depot's allocated vehicles, including tackling repeat defects to maximise fleet availability and reliability.

Maintenance regime

Maintenance plans

- Focussed on VMIs, a schedule of preventive examinations and associated corrective repairs generally based on Reliability Centred Maintenance (RCM) principles
- Continued review and evolution of the Vehicle Maintenance Instructions (VMI) based on feedback from failure data, modifications undertaken, business needs, etc
- Exploiting/testing opportunities to make changes (e.g. more frequent filter renewals to prevent failures)
- Condition monitoring, latest developments in communication technology and data storage
  - can offer a radical change in rolling stock maintenance by eliminating routine tasks

Use of OTMR data to obviate routine maintenance

Southern risk-based maintenance plan revision

Exam scheduling

- Match exam and repair work to the downtimes agreed for service availability requirements
- Balanced or cumulative exams to best fit the situations
- Important not to compromise the quality of work to fit too tight a downtime
- Regimes can be a mixture of time, mileage and/or duty cycles according to the different train systems. A compromise of grouping activities together is generally reached
- Older rolling stock – light Level 4 maintenance and heavy Level 5 overhaul (e.g. C4, painting/C6)
- Modern vehicles – heavy work based around high-mileage bogie overhauls because of advances in suspension materials and technology
- Integrating Level 4 and Level 5 saves vehicle downtime. Requires suitable tooling up but can encourage holistic maintenance

Wheel reprofiling light cut to maximise wheel life

Class 357 C4 extension, based on wheel condition

2. Depot Maintenance Activities

Defect Management

Reliability data is needed to understand what is happening, where to concentrate effort and how effective that effort is. Common high-level reliability measures are useful for looking at trends across the national fleet (and are reviewed at regular ReFocus meetings).

Many operators call this type of record a Failure Mode Analysis (FMA). Best practice FMAs include:

Collect Data

- Capture all failures and as many potential failures as possible
- Record the operational event and impact
- Data sources: TRUST, Control logs, driver feedback, OTMR/TMS
- Observed failure characteristics related to actual equipment defective condition

TPE use of TMS, OTMR, CCTV, etc. to help identify what happened

Analyse Data

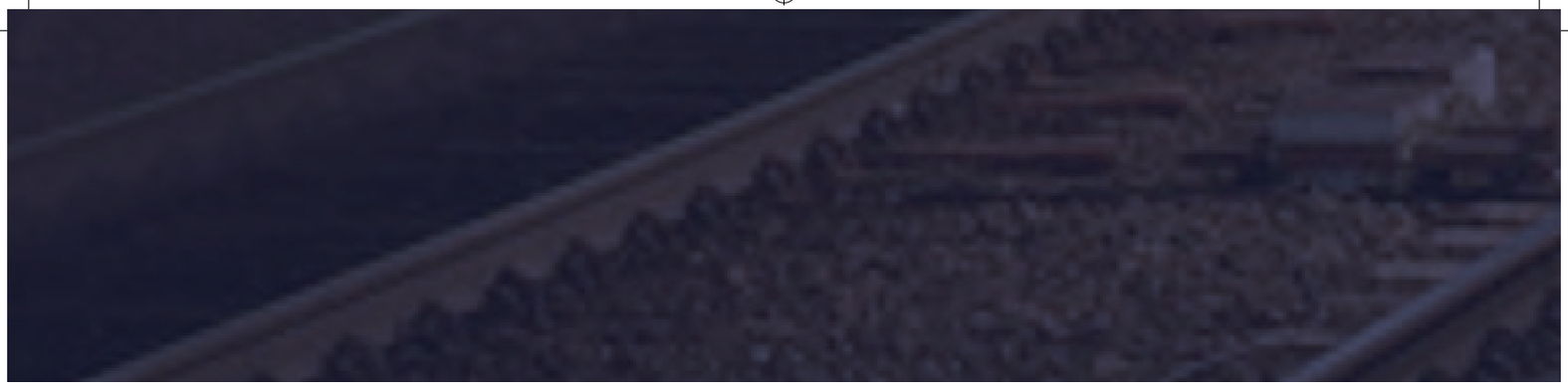
- Unambiguous identification of the failed component
- Cause of failure and failure mode
- Standard coding for all vehicle components
- **Find the root cause** – do not accept 'No Fault Found' without thorough investigation

Fleet BUGLE to collate and analyse failure data

Targetted Action

- The right information to the right people for most effective corrective action
- **Focus on Top 10 technical issues** (rather than trying to fix too many defect root causes at once)
- Pareto analysis: 20% of work to fix 80% of problems

C2C war rooms at East Ham depot



Techniques in support of defect management

- Use of modern technology (condition monitoring), identify potential failures before they happen

Bombardier Mitrac for modern fleets incorporates effective repeat defect flagging

Remote Train Monitoring (RTM) fitted to all Anglia Class 90 and DVT vehicles

- Create staff development programmes to teach technicians about investigation and analysis. **(see 2.3 Fault finding guide)**
- Tireless focus on repeat faults/NFFs

Southeastern root cause meeting, top 5 Repeat Embarrassing Defect (RED) process

Central Rivers depot does not accept more than two NFFs until something relevant is found

- Share the problem

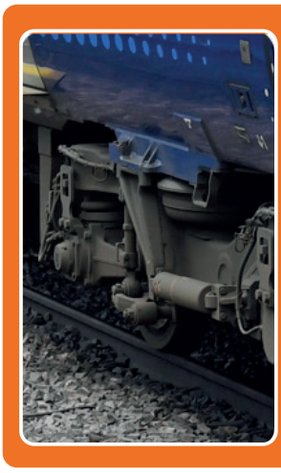
At C2C, every TRUST incident is discussed with operations at a daily conference

- Periodic analysis and review using proper statistical techniques to ensure continued effective solutions and processes to tend towards the long-term solution

TPE Dynamic Variance Charts, measuring actual performance against a predicted level

2. Depot Maintenance Activities

Related issues



Configuration

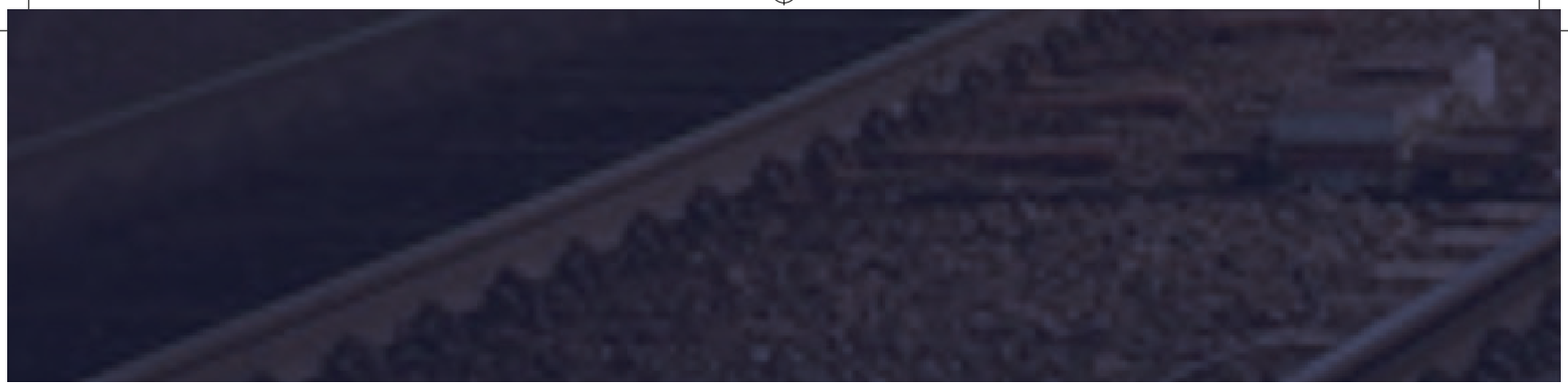
- The modification status of the vehicles and the parts fitted to them are required for a stable benchmark for reliability performance and meaningful fleet comparisons
- Clear records of configuration (vehicles and drawings) will:
  - Help with heavy maintenance
  - Ensuring that the correct spares are ordered and successful modifications are not undone
  - Assist when fleets are split and combined across different TOCs and ROSCOs

Deferred work

- Dependent on the availability of vehicles, parts, personnel or other inputs
- Deferred work trends are a measure of adequate production capacity and require action if the trend is not downwards
- Vehicles with less deferred work tend to be more reliable
- Best practice:
  - Regular (e.g. weekly) review of outstanding deferred work
  - Communication with maintenance teams (briefing, feedback) with the target of zero deferred work off exam
  - Monitoring deferred work trends (No. of items per vehicle, systems affected, reasons, etc)

GWR have created headroom in planned maintenance exams for defect clearance

Soho depot deferred work database, records root cause of deferral



Understanding availability

A consistent and reliable level of availability must be established to prevent excess vehicles being unnecessarily leased or persistent failure to deliver to timetable.

Running 3 cars vs 6 on certain trains to release time for repeat failure investigations

C2C 15-month painting programme achieved by reducing traffic requirements

Availability vs reliability

Balance availability to ensure reliability is not compromised. Repairs should be done to promote reliability, rather than deferred to chase short-term availability.

'Hot' spares, bigger fleet

Extra vehicle leasing costs can be justified by reliability performance improvement. Improve understanding to reduce incidents of substandard vehicles being offered for service.

Measuring availability

Typically measured just prior to morning and evening service peaks.

Typical reasons for unavailability are:

- Peaks and troughs beyond capacity
- Out-of-course incidents, repeat failures
- Depot capacity and capability (e.g. waiting shed space, parts, specialist staff, etc)
- 'Lumpy' modification workload

Cross Country use of Wheelchex to plan and prioritise tyre turning to prevent availability problems

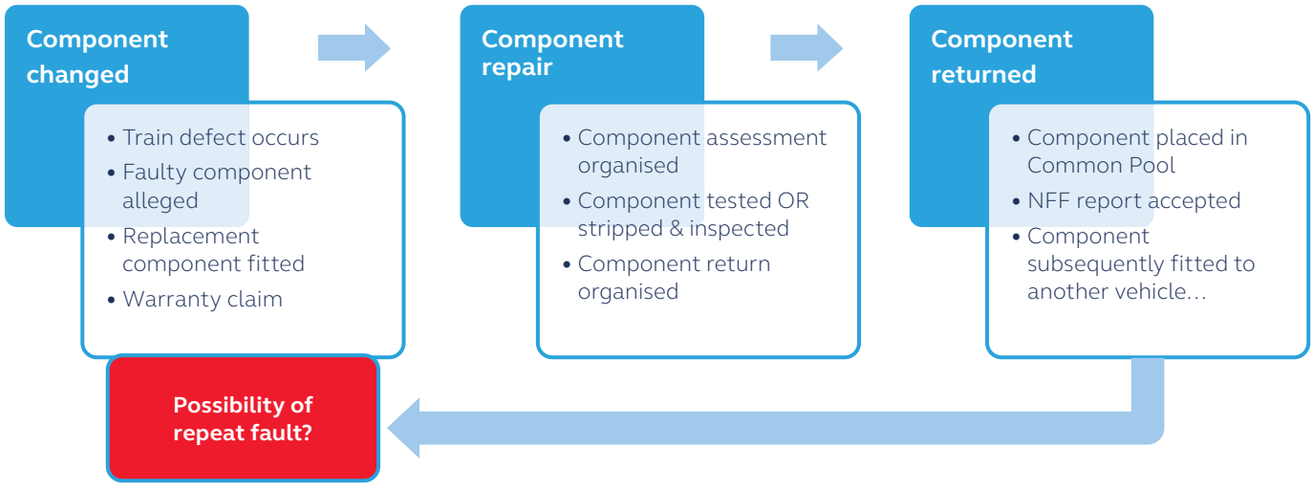
West Coast Traincare round-the-clock phone conferences, several availability counts

Critically, **the reasons for each unavailable vehicle must be identified, recorded and trended within each fleet/TOC** to identify improvement opportunities and measure their success or otherwise.

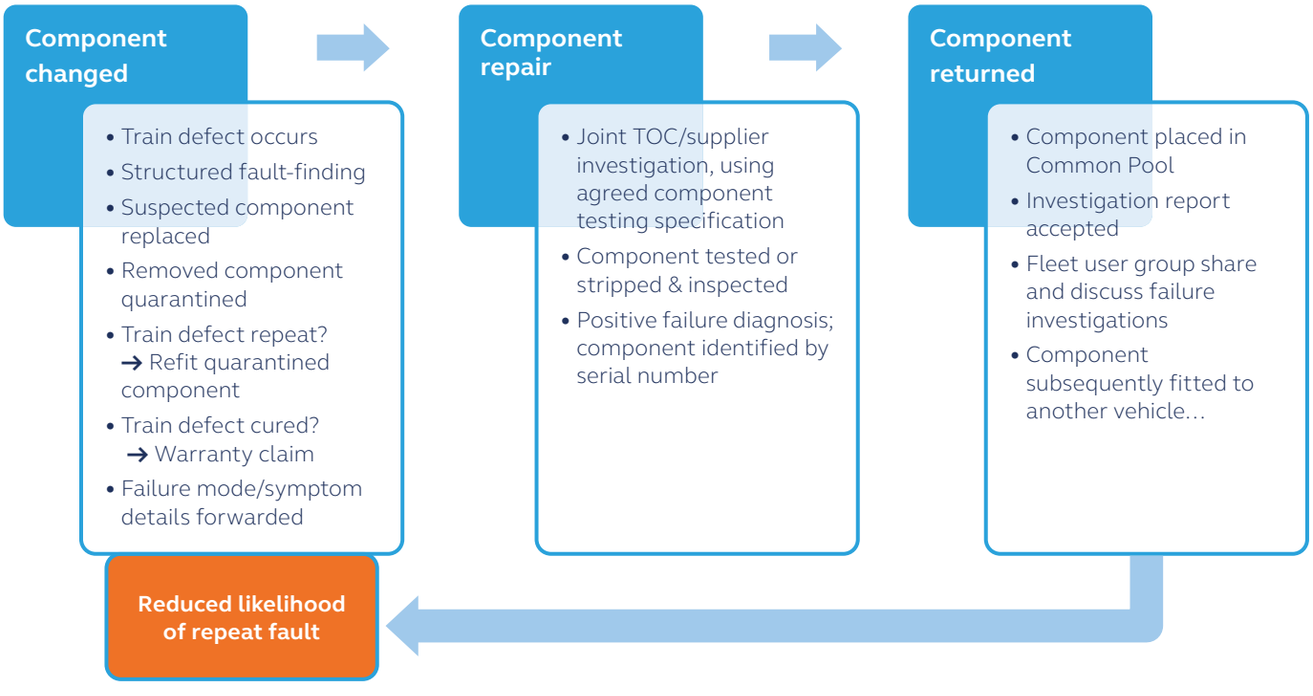
2. Depot Maintenance Activities

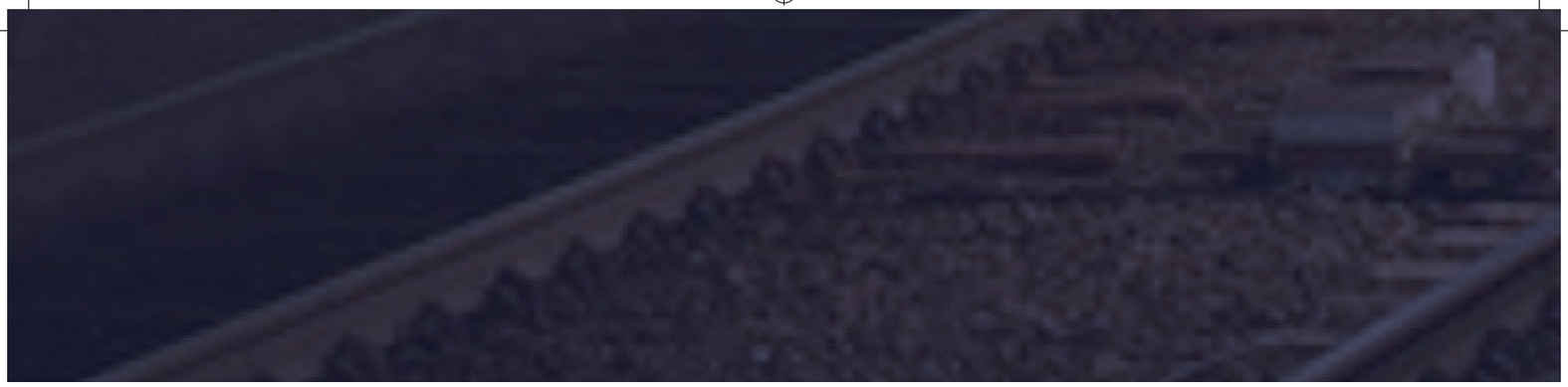
2.5. 20PP Section 16: No Fault Found Warranty Claims

The chart below represents a typical warranty return process for components where the supplier finds no fault.



This revised chart represents good practice set out to reduce the likelihood of NFF and subsequent repeat fault:





Depot-related issues for No Fault Found Warranty Claims

Initial fault-finding and decision to change the component

- Pressures to deliver a reliable service may lead to components being replaced as a preventative measure
- TOCs should avoid having a 'change it' culture (could be shift- or depot-specific)
- Fault-finding guides should focus on failure symptoms and look to identify root cause

Managing the component once removed from vehicle

- It is good practice to quarantine suspected components to see if the fault reoccurs, prior to returning it to the supplier → if the fault reoccurs then refit the component and identify a different failure cause
- All relevant details of the failure (including symptoms, TOC diagnostics, etc) and why the component was changed should be recorded

Making the warranty claim

- Warranty management should be a critical part of managing fleet reliability (e.g. ensuring warranty-related issues are routinely discussed at reliability meetings)
- Use agreed warranty claim reporting templates/documentation and ensure all agreed information is sent with the claim to assist the subsequent investigation

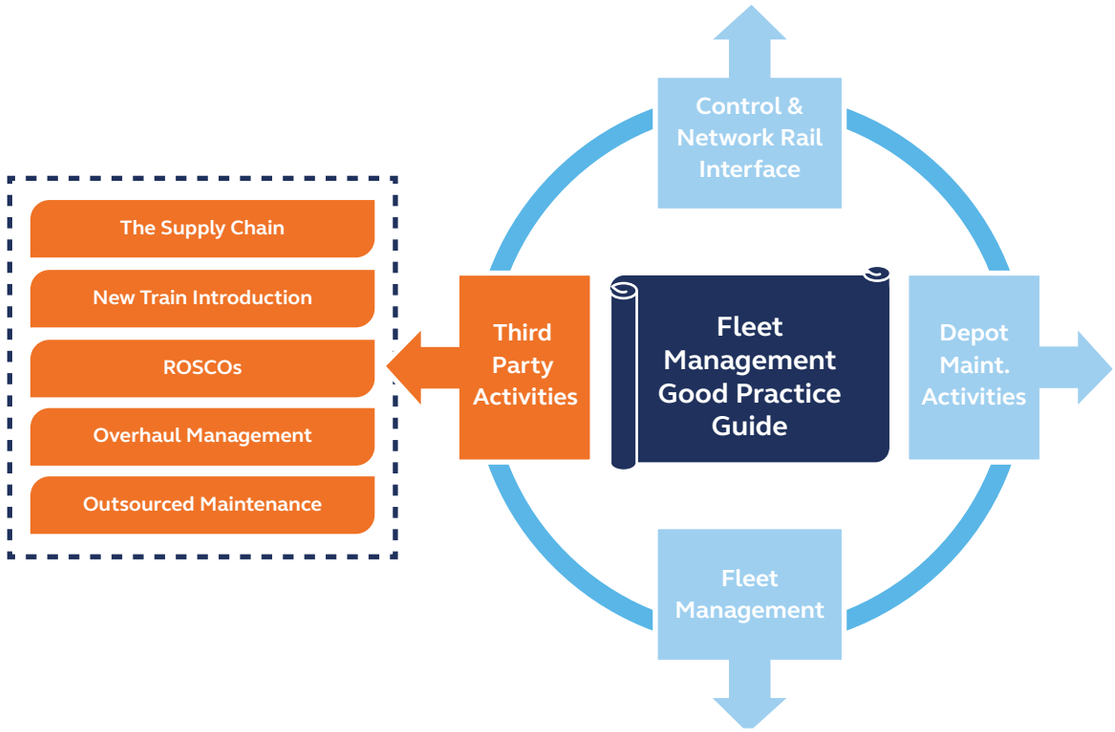
Collaborative working

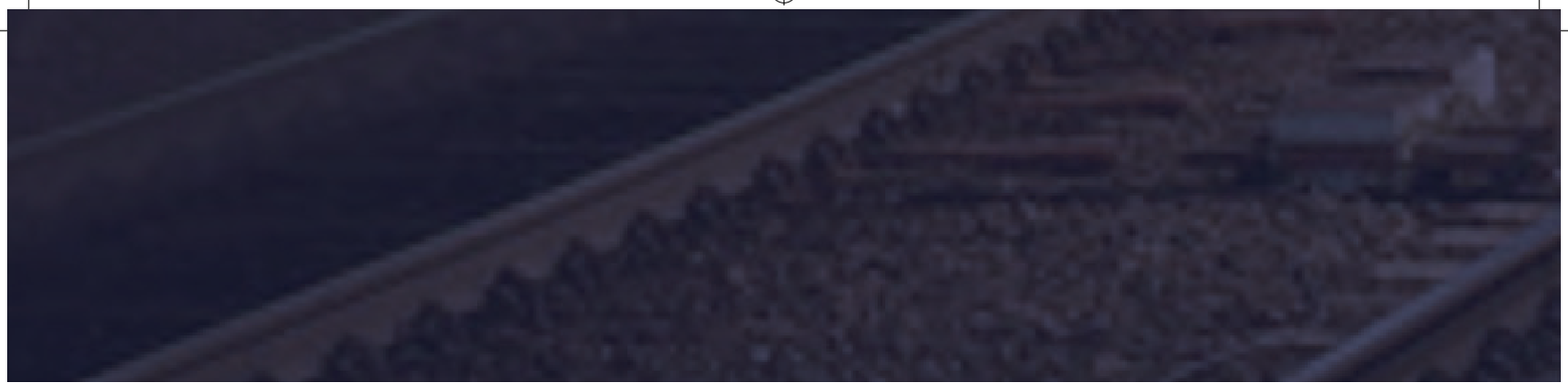
- Collaborative relationships between TOCs and suppliers can improve the quality of failure investigations and reduce the number of NFF diagnoses
- Agree component testing specification to ensure that supplier testing properly reflects vehicle environment (e.g. putting electronic equipment through 'shake and bake' tests)
- Use fleet user groups to identify common component faults, share failure analysis data and work together to reduce repeat failures

East Coast monthly technical/ commercial meetings with suppliers

3. Third Party Activities

This section of the Condensed Guide focuses on those activities involving working with third party organisations who can have significant impact on fleet performance, whether that be new trains, overhaul of existing trains or component supply chain activities.





3.1. 20PP Section 14: The Supply Chain

The rail industry supply chain is complex and includes a huge network of smaller supply chains organisations (1st, 2nd, 3rd tier, etc) beneath the immediate TOC/ROSCO/Maintenance Contractor relationships.

Supply chain activities can significantly influence national fleet performance in terms of the reliability, availability and performance of the rail vehicle components, products or services.

It is vital therefore to understand the interdependencies/interfaces between different supply chains, particularly for equipment used across multiple fleet types (e.g. brake actuator).

Understand, provide for and anticipate the needs of current and future UK rolling stock operations

A culture of continuous improvement that seeks to adopt best practice, both from within and outside the railway industry

An effective supply chain, providing efficient through-life material supply

Have the capacity and skills to deliver targeted asset enhancements that will underpin and improve fleet performance

Be cohesive (i.e. a linked chain with aligned interfaces) and understand the wider implications of its decisions and actions

Factors influencing supply chain performance

- Business change management
- Configuration management
- Component robustness, testing and tracking
- Material support contracts and availability
- Economies of scale

The 20PP provides a detailed list of issues, intended as a checklist for stakeholders to manage supply chains, assess their applicability and determine opportunities and priorities for improvement.

Cross-industry priorities for improvement

- ✔ Accurate measure of depot material usage and allocation of material for planned maintenance work (level 1 to 4 or level 5) to help suppliers forecast demand
- ✔ Share lists of critical parts to create a master list of parts that require buffer stocks
- ✔ Parts supplied in kits that are time-critical for repair should be highlighted accordingly
- ✔ Aggregate material usage data from multiple users to set appropriate stocking levels for all
- ✔ Early communication over non-availability of parts to minimise the impact on train availability
- ✔ Regular supplier feedback to TOCs where demand levels change, causing over/understocking

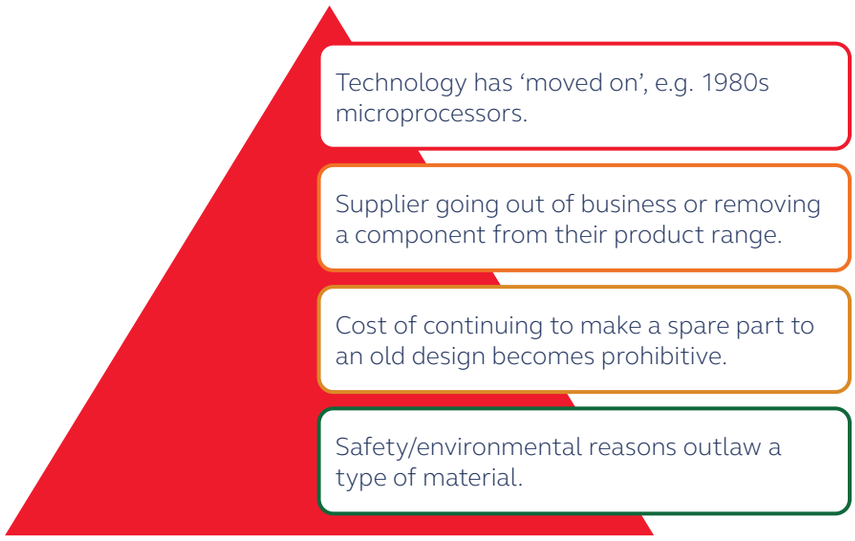
Additional areas for improvement:

- Management of 'rogue' components (repeat offenders)
- Configuration

Appendix D of the 20PP gives more detail of Industry Supply Chain Workstreams

3. Third Party Activities

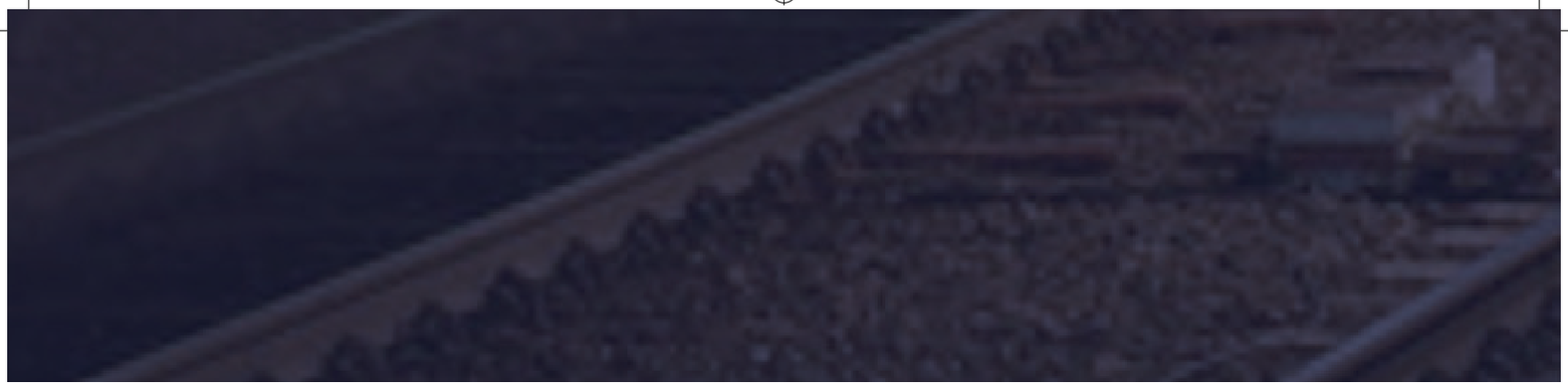
Managing obsolescence



Best practice is to actively manage obsolescence throughout the life of the vehicle, seeking out best practice from other industries

Principle 1	• Agree technical/commercial ownership for obsolescence from the outset	**Porterbrook obsolescence ownership included in an agreed TOC-specific fleet management plan**
Principle 2	• No one party has all the answers to obsolescence. TOC, ROSCO, OEM, suppliers all have a part to play	**Cl. 313, 507/8 Brake Code Conversion unit replacement using modern relay components**
Principle 3	• Establish a process for identifying obsolescence, eg fleet user groups, supply chain reviews, etc	**Porterbrook's fleet technical reviews include obsolescence as standard**
Principle 4	• Create a plan to manage and prioritise risks. Agree a governance approach	**Unipart Rail obsolescence risk register for specific TOCs**
Principle 5	• Tell everyone – communicate obsolescence risks across the whole supply chain	**Fleet user groups with relevant ROSCOs, TOCs and Suppliers; cover incidents/technical issues including obsolescence**

20PP Appendix E provides some current examples of best practice in supply chain management, including the results of current/recent workstreams.



3.2. 20PP Section 15: New Train Introduction

How to buy a new train fleet to get the best out-of-the-box service performance.

Cannot help but involve (large) third party organisations; two powerful principles therefore:

- The effective deployment of significant TOC resources; and
- Adequate timescales and sufficient contractual rights for the TOC
- RDG Guidance Note: New Trains – A Good Practice Guide **(RDG-ENG-GN-008)**

Pre-contract – product selection

Planning: Adopt a one-team integrated approach early on: operational-engineering-commercial

- ✔ Freeing up key TOC staff better than hiring consultants
- ✔ Consider including Network Rail and drivers' representatives
- ✔ Invest time in agreeing a detailed train specification upfront
- ✔ Heroic timescales are less likely to produce good trains!

Specification development: Technical; Passenger environment; Depot/Station interfaces

- Keep it simple – a bright new interior, riding on proven technology may be all that is required
- Do not be afraid to challenge outdated or irrelevant standards. Allow time for derogations
- Any governmental requirements (in additional to regulatory requirements) can be high level or aspirational; allocate sufficient time to work up detail and challenge if necessary
- Understand and drill down into the details, e.g. doors
- Specify TMS/data capture and no single point failures
- Ensure the right to participate in final design review

DfT specified (C-DAS) for the Cl. 700 but did not include details

Commercial strategy: Manage procurement in-house or outsource it?

- Start with five or more train suppliers/financiers and run with at least two
- ROSCO and TOC speak with one voice to the supplier
- Develop a risk allocation matrix – who is responsible for what
- The person who reviews the bids should be the person who lives with the product

For their new high-speed, TSI-compliant trains, Eurostar issued a tender to negotiate

Maintenance strategy: Train and spares only; Design-build-maintain; Availability contract (etc)?

- Set targets for overhaul cycles and routine maintenance periodicities
- A whole life maintenance plan may not be available at this stage → risk!
- Is an aftersales division of the supplier providing any of the services?

Different logistics arrangements for Cl. 700s at Three Bridges and Hornsey causing issues – missed opportunity at the contracting stage

Role of Network Rail (or equivalent): Is land available for new depots, additional siding space, etc?

- Station design and platform lengths; include other operators as appropriate
- Plans for electrification – are they on schedule? Bi-mode may offer short term security
- OLE/3rd rail parameters and interfaces

3. Third Party Activities

The contract

Be prepared for cultural issues and/or disconnects between commercial and engineering departments in different individual business units and/or different countries.

Recommendations around acceptance and delivery

- Insist on delivery gateways (e.g. First Article Inspections, type test reports, mature software)
- Insist on defined performance levels for proven products
- Time to evaluate first trains built before full fleet delivery, especially for a new design
- Regard supplier's aftersales department as an internal 'customer'

TPE gave drivers a pre-handover period (2 weeks) to test train fault scenarios

Technical documentation and data

- Be specific with the content and format of technical and user documentation in the contract
- Web-based interactive manuals can conflict with the basic Document. Control principles
- Request timely delivery of special tools (e.g. laptop-based diagnostic software)
- Safety critical components to be identified for approval (ref RIS-2750-RST)
- Either formally review/approve or require sight of Vehicle Maintenance Instructions (VMI)/Vehicle Overhaul Instructions (VOIs)
- Ensure access rights to all data within the Train Management System (TMS) and associated software

Supply chain management

- Inferior components have been substituted without TOC approval
- Contractualise the right for TOC to audit supply without warning

Obsolescence management

- Obsolescence risks should be identified as a whole life issue (see 3.1)
- Seek flexibility in the design for future proofing, especially electronics/software.
- Design knowledge being held at sub-supplier level can be a risk

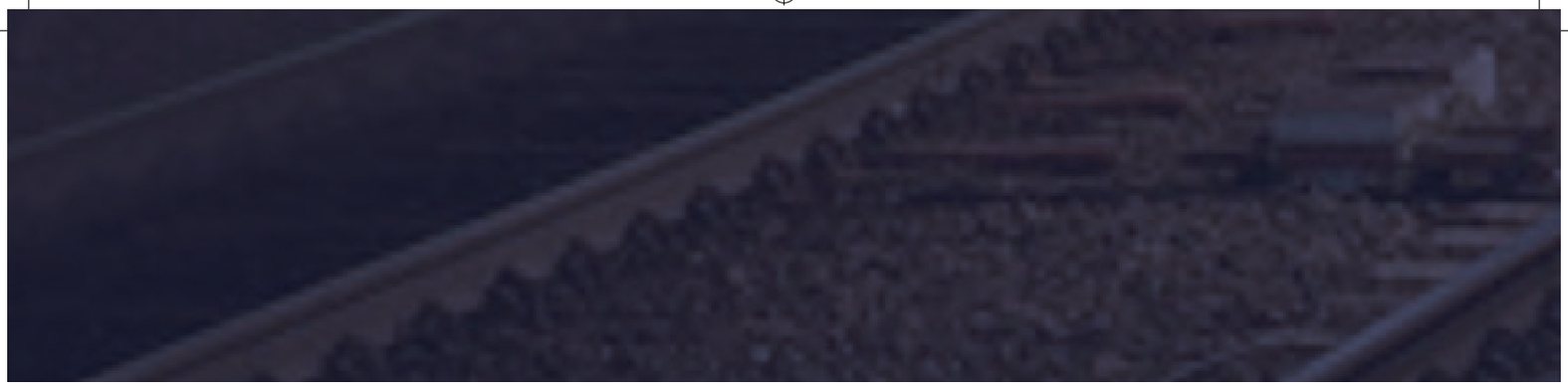
Financial recommendations

Performance

- Use current, standard industry measures (e.g. MTIN – ***not*** Miles per Casualty) as KPIs
- Supplier to be responsible for problems due to poor ergonomics, man/machine interface
- Include targets for passenger amenities
- Ensure that warranty terms and incentives are clear, realistic and enforceable
- Endemic defect clause such that further purchase halted until issue is resolved
- Retention bond available to put right a major system failure, beyond warranty)
- Seek timed and priced options for flexibility

Payment profile

- ROSCO wants a train that is leasable throughout its life; TOC wants a reliable train that meets its franchise requirements
- Choice of ROSCO may be affected by their willingness to make lump sums available and attitude to post-contract variations
- Need for good TOC-ROSCO relationship:
  - Robust incentives for manufacturer to close out technical issues
  - Link payments to the formal approvals milestones (certification)
  - Pricing transparency on any VO from the supplier (errors have doubled costs)



Design and manufacture

Functional specification

- Identify issues important to operation and defects mitigation:
  - times for (un)coupling; door operations; changing ends; driver prep;
  - short platforms (SDO) and DOO;
  - re-start after a 3rd rail or OLE outage;
  - access to equipment for in-service diagnostics and fault mitigation;
  - mechanical and electrical compatibility with existing fleets
- Never assume that the supplier has operational knowledge of products
- Seek early involvement of ASLEF driver representatives in cab design

Design review

- Check manufacturer's technical spec. against functional requirements
- Get to know the design especially critical systems such as doors
- Be clear about nature and timing of design and standards freeze
- Standards conformance – any derogations required?
- Change control – agree all changes in writing; keep all correspondence
- Interfaces – infrastructure, traincrew, passengers, other trains)
- Focus on software functionality
- TMS data capture – focus on the top 10 likely defects

Manufacturing preparation – desktop information

- The TOC should:
  - follow type approval through to production roll-out;
  - check consistency of production and manufacturing standards;
  - check manufacturing arrangements for critical installations (OEMs as well as main supplier)
- Use first article inspections as a formal method of verifying manufacturing processes
- Confirm supplier Quality Management System (QMS) processes such as: training & competency, goods inwards inspection and configuration database.

Manufacture in practice – on-site presence

- TOC engineers on-site with unrestricted access:
  - monitor that work is progressing to spec./drawings (typical quality issues include anti-corrosion treatments, paint finish, build tolerances, bonding and watertightness)
  - facilitate communications on the latest issues
  - undertake 'factory gate' commissioning
- Mistakes are costlier if not addressed early. Use risk analysis to identify potential failures and delays to the plan

Southern had three representatives at Bombardier's factory and commissioning depot to identify and resolve issues

3. Third Party Activities

The acceptance process

Preliminary acceptance

- 'Factory gate'
- 1000 miles of test track running (fault-free)

Commissioning

- Static and dynamic tests
- Demonstrate trains can run safely on Network Rail
- Includes noise, ride, interior finish
- 'Zero miles' exam

Provisional acceptance

- Static 'shakedown' test after 15k miles trial running
- Trains are then 'procured'

Final acceptance

- 2 or 3 years on
- Each train has had all retrofit mods and software versions upgraded

Test tracks are great for proving the design and initial mileage accumulation BUT a true indication of reliability only emerges from experience in passenger service.

Service introduction

Interface with Network Rail
Weekly meeting, e.g. book test slots and establish compatibility on all relevant routes

Interface with operations
Allow for 5 or 10% increase in drivers due to training needs and test running

Use low mileage, less-than-a-day, return to-depot diagrams

Interface with manufacturer
How long will supplier's support be available?

Be wary of using equipment outside warranty conditions Defective On-Train

Equipment (DOTE) policy 24/7 on-call groups of train systems specialists

New train integrated into the Safety Certificate

Phased fleet introduction or full fleet introduction?

Siemens Cl. 700 'wiki' resource repository of knowledge for maint. staff

Reliability growth – delivery to the passenger

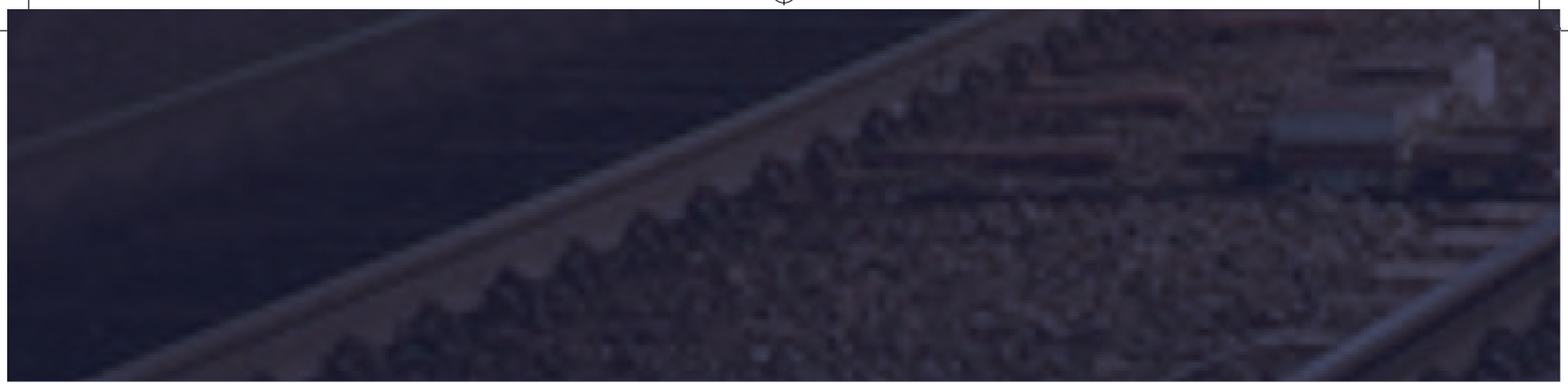
Design for maintenance early on

- Expect multiple updates/mods. at differing intervals
- TMS data capture critical
- Robust test regime after updates/mods. to monitor success
- Software updates should be held in ESCROW until updates are proven

Measure everything – and follow it through

- Significant resource required to monitor performance, mitigate and resolve root causes of unreliability
- Collaborate with traincrew – they're the first to see problems. Build confidence by providing feedback
- Support for maint. & operations controllers, e.g. a technician from manufacturer in the control room
- Exploit TMS data and make it fully and freely available
- Give sufficient attention to passenger amenities (toilets, wi-fi, air-con., etc)

TOC always has safety and overall business risk – and will be in the spotlight when (if?) things go wrong



3.3. 20PP Section 17: ROSCOs

ROSCO – TOC relationship through FMP

ROSCOs:

- Own vehicles for life
- Procure heavy maintenance
  Manage critical spares pools

ROSCOs can:

- Build reliability into new train procurement
- Take reliability lead across several fleets
- Work with the supply chain to resolve parts issues
- Implement 'step change' modification packages

This Section looks at these specific issues and explores what they mean, setting out current practice (including some examples of good practice) and aspirations for improvement.

Each fleet with each TOC and ROSCO: Fleet Management Plans (FMPs)

Link to DfT requirements for the operator contract

Reliability growth, in line with contract plan

Fleet Management Plan

- VMI/VOI, technical data
- Safety, e.g. live NIR matrix
- Performance improvement plans
- Modification/enhancement plans
- Supply chain, obsolescence

Focus for TOC/ROSCO relationship

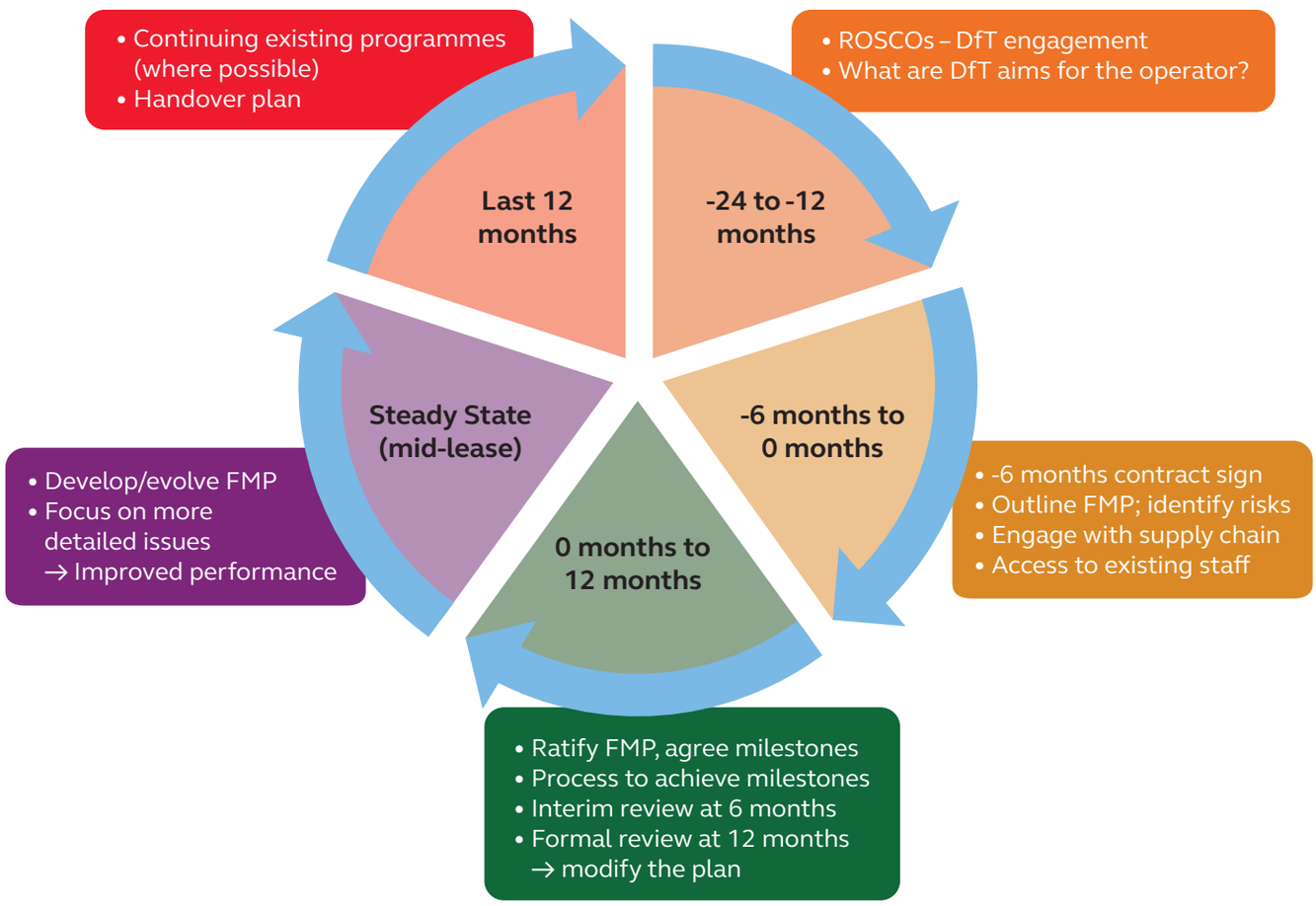
Periodic review and update, part of the lease review process

Angel and ScotRail FMPs, linked to ScotRail Reliability Action Plan (RAP)

Eversholt short-term (12-month) FMPs. Joint fleet planning workshop to identify 'quick wins'

3. Third Party Activities

Relationship of FMP with lease/contract cycle



TOCs want *optimum*, not necessarily ***maximum***, reliability to balance other business needs and stakeholder priorities.

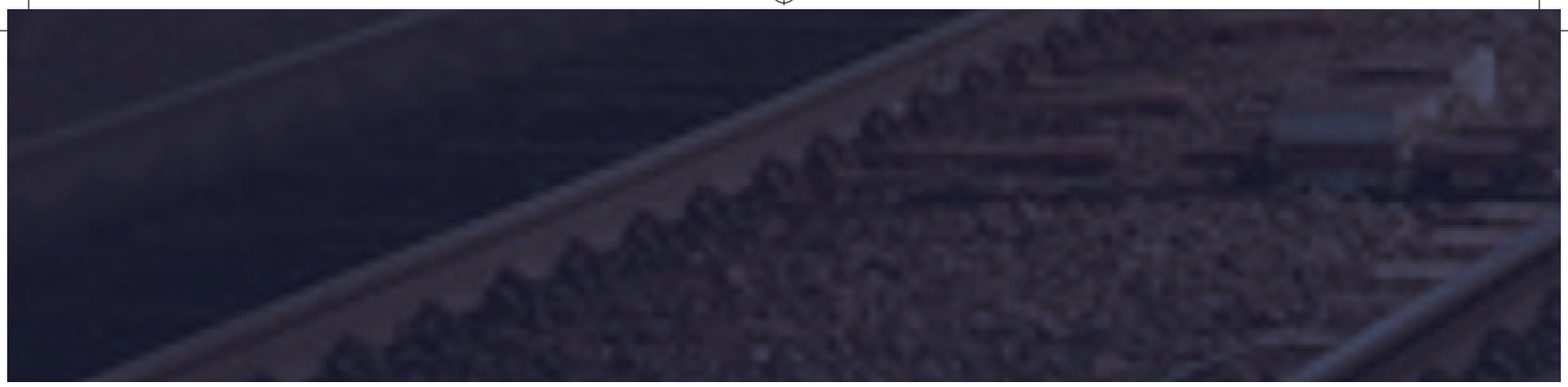
Common issues

ROSCOs are in a unique position to take a lead in reliability improvement and common issues/challenges across several or even all fleets

- Help join up thinking and make constructive comparisons between different TOCs with the same/similar vehicle classes, including new/recent builds issues with manufacturer
- Heavy maintenance programmes are fundamental to reliable fleet performance
- Consistent collation of reliability-centred performance data is key

Eversholt joint technical reviews with TOCs from different owning groups on Classes 313 and 321

EMT monthly fleet performance meetings, sharing data with Angel and Porterbrook engineers



Improvements can be achieved through ongoing user groups or a specific working party.

- User groups can be component-specific (e.g. Cummins user group, Voith steering group)
- User groups should be linked to the RDG web page to facilitate the sharing of knowledge and engagement between groups
- They should all cover reliability improvement/ risk mitigation issues, as well as sharing safety concerns and advice

Porterbrook Turbostar user group. Max. two train systems per meeting for best focus

Northern-led refreshed mid-life DMU user group, modelled on Electrostar user group

Optimising for duty cycle

ROSCOs facilitate the transfer of maintenance plans and are well placed to observe practical examples of duty cycle-related maintenance and share best practice.

Bombardier East Anglia Class 170 Value Improvement Programme.

Different component maintenance periodicities for Hornsey Class 317 fleet according to sub-fleet use.

Angel Desiro fleets introductions and unified maintenance manual.

Fleet transfer/cascade: Liaise with ROSCO

The ROSCO is responsible for eliciting and transferring information from all maintenance providers, such as exam cycle phase, outstanding defects, any known problems or special control measures.

Robust TOC/ROSCO FMP can prevent reliability issues during stock transfer. A risk workshop can be an effective tool to manage smooth stock transfer and minimise potential impact on reliability.

20PP Appendix F provides Fleet Transfer Checklists.

The recommended Fleet Transfer Process is illustrated on the next page.

3. Third Party Activities

Handover plan agreed by all stakeholders

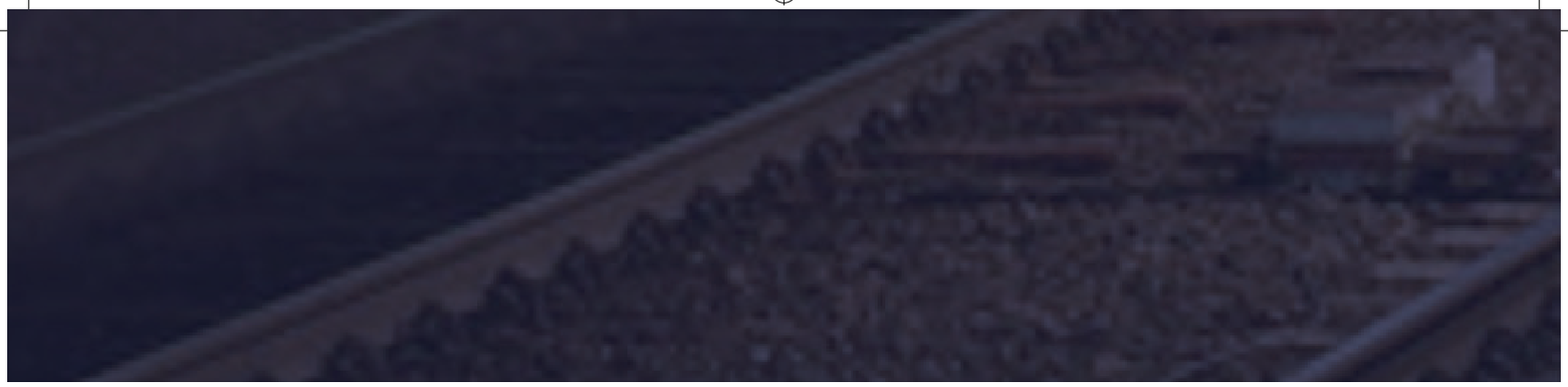
- Key milestones/critical path
  - Fleet compatibility/special requirements
- Lease type (wet/dry)
  - Include TOCs, ROSCOS, OEMs/supply chain
  - Small fleet or whole fleet? Short-term versus long-term?

Initial planning phase (prior TOC stock transfer)

- Initial pre-delivery condition survey:
  - Condition of the vehicle(s)
  - Position in Heavy Maintenance programme
  - Adequacy/ownership of spares
- Network Rail/Train planning (route/station suitability, sectional running times, station dwell times)
- Operations issues (e.g. driver/guard training, seating configuration/reservation requirements, etc)
- DfT/Community/Passenger focus (service expectations, environmental impact)
- Rebranding? Can be time-consuming process → plan as a self-contained project

Preparation of stock transfer and stock introduction

- Rolling stock configuration
  - SDO, PRM, DOO, any experiments/trials in progress?
  - Change of formation? (e.g. 3-car to 2-car unit)
- Maintenance/depot integration
  - Resolve any outstanding NIRs, complete outstanding fleet checks
  - Exam/overhaul cycle planning (VMI/VOI, OEM support/warranty)
  - Materials/spares planning (OEM support, supply chain, tooling requirements)
  - Facilities (Shed/siding space (length of vehicle/trainset, height/weight), lifting/jacking requirements, CET facilities, etc)
  - Power supplies, extraction equipment, fuelling
- Staff training programmes (vehicles may be required for both engineering and operations staff to train on). Manuals/training aids available?
- Operational considerations
  - Stabling of additional units and overnight berthing arrangements
  - Route compatibility (Stop boards, DOO Monitors/mirrors, stepping heights/distances)
  - Passenger information systems (upload new route information)
- Service level introduction of rolling stock
  - whole fleet or staggered intro to allow for familiarity, bedding in
  - Reliability growth plans (plan for initial 'bedding in', previous/existing reliability data ('top ten'))



3.4. 20PP Section 18: Overhaul Management

Vehicles re-entering service post-overhaul can suffer from reduced reliability. A tri-party approach between ROSCOs, TOCs/maintainers and overhaulers to jointly manage the overhaul process in line with best practice can prevent this.

The high-level overhaul process

START: Need for overhaul identified from horizon plan → DEFINE SPECIFICATION → SELECT OVERHAULER → MOBILISATION → THE OVERHAUL → CONTRACT REVIEW → STOP: Trains back in service

1. Need for overhaul identified from strategic plan

The publishing of strategic plans, reviewed and updated to incorporate recent developments:

- Helps the industry to form a more complete view of overhaul plans and timescales nationally.
- Identifies conflicts of resources, enabling efforts to be made to smooth out demand.
- Provides the supply chain with information to secure investment for future bids.

Porterbrook openly publishes a six year overhaul plan on its website, enabling suppliers to plan future bids

2. Defining the specification

Overhaul specification timescales

Develop overhaul spec. prior to contract award

Late-notice contract variations can result in additional costs and delays, based on:

- the complexity of the overhaul,
- the number and experience of stakeholders involved
- the initial scope and
- lessons to be learned from previous overhauls

Overhaul specification method

Tri-party development of the overhaul spec.

Possibly extend joint approach to include other parties, e.g. where a fleet is common to other TOCs and ROSCOs.

Periodically review and update specs. to:

- learn from experience of vehicles in service
- capture best practices for the next overhaul
- remove tasks which no longer add value

Alstom Development for Quality (DfQ) V model to plan their overhaul design and delivery

Overhaul specification content

Condition assessment prior to overhaul.

Involve TOC operations staff to take into account the users' perspective.

Use technology such as endoscopes to inspect hard-to-reach corrosion and fatigue areas.

Former British Rail overhaul specs. may not reflect modern maintenance practices or competence regimes.

Testing should be an integral part of the spec.

- Pre-test relevant systems whilst still on train
- Test all disturbed components
- Specify what test equipment is required

Create photo record to capture condition.

Overhaul specification outcomes

Jointly understood outcomes, focussing on:

- improving the reliability of the entire train,
- 'resetting the clock' in terms of asset condition
- incorporating changes to ensure the vehicle is fit for future purpose, easier to operate & maintain.

Measure fleet performance with respect to these points pre- and post-overhaul measured.

Financial outcomes also need to be considered:

- the cost of the overhaul itself
- life-cycle costing
- future maintenance costs, e.g. new or existing equipment/systems not currently in the VMI

3. Third Party Activities

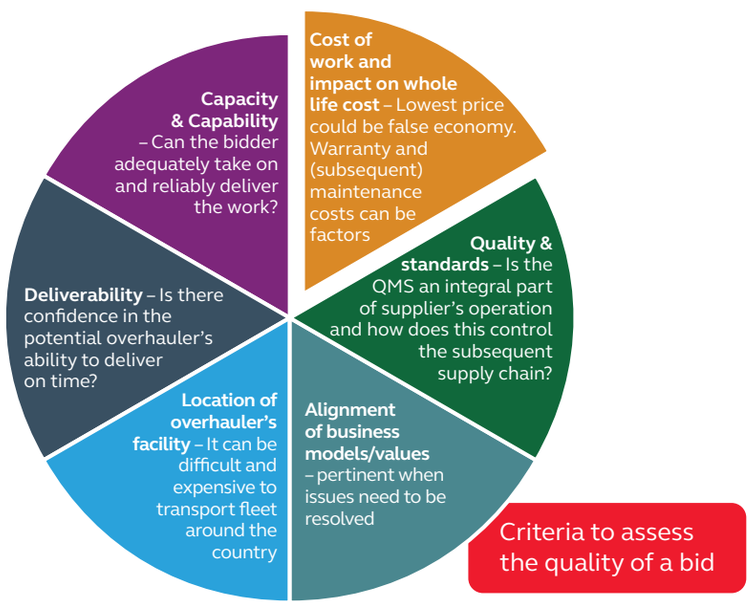
3. Select overhauler

The ITT should:

- ensure suitable service level agreements to incentivise correct behaviour from all parties (e.g. delivery of the vehicles/unit for overhaul on time by operator
- Require an overhauler to respond to the procurer's questions using a compliance matrix

Involve several stakeholders in evaluation of the proposal.

Inform unsuccessful bidders why their bid was unsuccessful and what they would have needed to be successful.



4. Mobilisation

To commence at least a year in advance of a major overhaul. The specification should also be defined within the same timeframe.

Alstom uses 12 months to plan between H exams and builds on previous experience

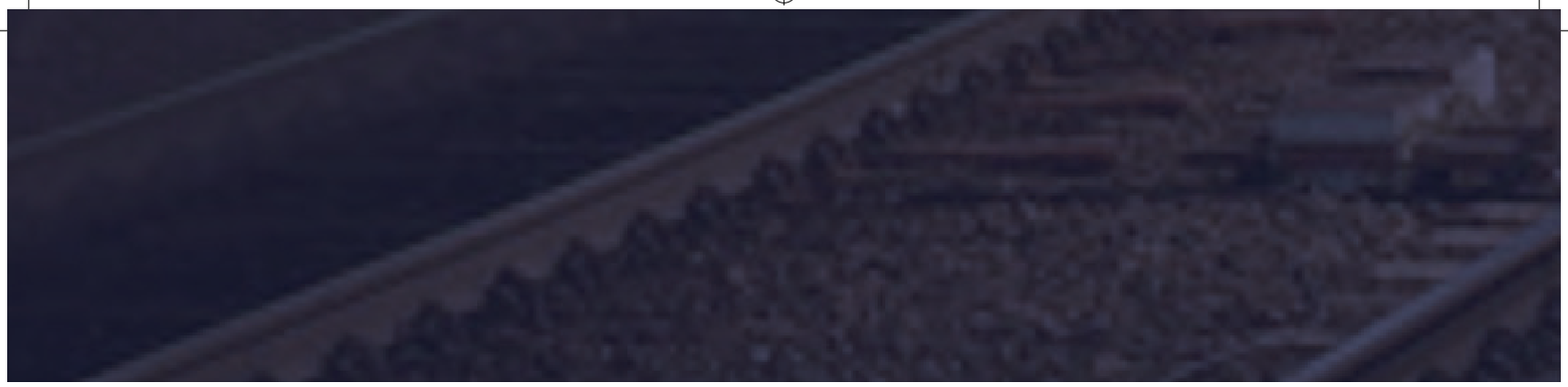
Creating a robust overhaul plan

- Overhauls can be very complex, with constraints, e.g. interdependencies with other projects, critical resources/ specialist work, long lead times etc
- Critical chain project management is a useful tool to ensure a robust delivery plan
- Co-locate overhaul activities to minimise transportation times
- Avoid use of rail barrier wagons/translators wherever possible (logistical issue)
- 'Make versus buy' analysis to decide which overhaul activities to outsource
- A pilot run before the main programme can help get to the steady throughput rate as early as possible. If not, try simulation

Wabtec bought a spare Mk3 coach to trial fit new exterior powered doors prior to start of main mod. programme

Human resourcing and competency

- A RACI analysis (who is Responsible, Accountable, Consulted and Informed) to set out clear roles and responsibilities for staff
- Use RACI to identify need for any staff recruitment and the skills/competency required
- Skilled project managers are key to any overhaul team, with experience of lean techniques
- Supplement CV/interviews with exercises based on genuine examples of overhaul work
- For older, legacy fleets, arrange for staff to see prior to overhaul (to experience the variances in vehicle manufacture)
- Aim to retain key staff during the 'troughs' to ensure consistency and minimise essential skills loss when the 'peaks' occur



Facility, components, tools and documentation

- Overhaul process flow within the facility should be designed according to lean principles (see 20PP Appendix J – Creating a Lean Process)
- Consider bolstering the float of commonly shared components to avoid impact on other fleets in normal operation
- All component suppliers should be approved within the customer's procurement system, including change management. RIS-2750-RST is relevant
- Fit for purpose' quality controls for components used in overhaul
- Warranty arrangements for components, where appropriate, from overhaul to overhaul
- Obsolescence management see 3.1
- Tools appropriate for the activity at each workstation; shadow boards for smaller items
- Controlled, relevant documentation (e.g. work instructions, designs, drawings, checklists, etc) readily available to shop floor staff and supervisors

5. The overhaul

This stage considers delivery of the plan created during mobilisation to the standard defined in the specification. Each time an overhauler goes through this process it provides an opportunity to make improvements, also for future overhauls, using lean techniques.

Receiving the train

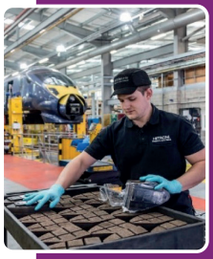
- Transportation of the vehicles as per plan to achieve the booked 'slot'
- Trains/components tested/inspected on arrival. Goods inwards should arrive with a certificate of conformity
- Resolve any issues over asset condition ASAP; possibly supply a different asset to allow time to resolve issues with the non-conforming asset

LUL treats the first two units of a programme as 'glass case' examples

Working on the train: a lean process

- Typically more time allowed for the first few units/vehicle assets going through the process
- Lean techniques can be employed to identify and correct process problems
- Analyse all activities and minimise those which do not directly improve the asset as per the overhaul spec

Wabtec utilises coloured overalls to easily identify the competence levels of staff



Working on the trains: the culture

- Utilise staff knowledge/experience to identify and implement process improvements
- Establish accountability without blame to deal positively with defects etc
- Peer review quality checks throughout the overhaul process so each team owns responsibility for passing on quality work
- Documentation sign-offs/swipe cards to record accountability and increase ownership of work
- Constructive feedback to staff on service affecting failures (SAFs); use to improve process
- Balance bad news with good news stories
- Sign off all consumables (where appropriate)
- Formal stage handovers to attend to defects and minimise impact of any rework

3. Third Party Activities

6. Evaluating the results

Involve TOC in train testing prior to handback. Consider:

- **Quality:** A systems approach to ensure any outstanding defects are rectified (much more difficult to do after the train has been returned to service)
- **Time:** If not being returned on time, why? Does throughput time need to be adjusted for future trains?
- **Documentation:** Ideally joint review with TOC the engineering measures and results for the overhauled train, along with details of any deferred work

7. Contract review

Joint and structured assessment of the entire overhaul programme

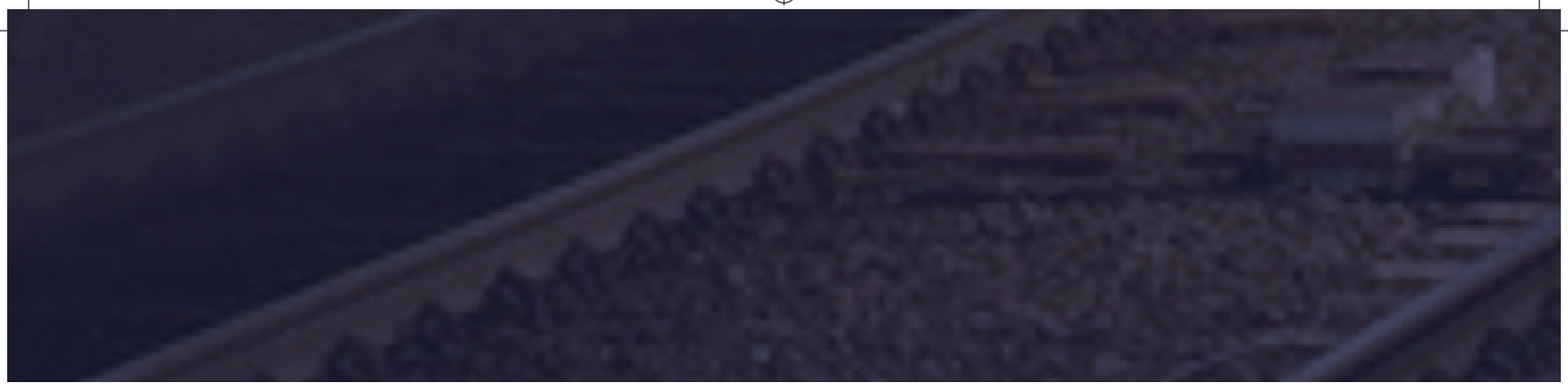
- Were intended outcomes achieved? If not, why not?
- Feedback must be balanced and fair, otherwise relationship becomes adversarial
- Overhaulers should supply key metrics to evaluate quality, time and cost
- The review should assess what went well so that good practice can be embedded
- Did the tri-party relationship work as intended?
- All parties should provide feedback on the contractual incentive/penalty conditions and how they were managed. Consider asking an independent party to facilitate this discussion
- Review the overhaul specification to understand how it might be improved

It is recommended that overhaulers implement a longer-term continuous improvement plan to build on the learning from successive overhauls.

8. Trains back in service

Overhaul programme effectively over

- Normal fleet management processes resume for the whole fleet
- Good opportunity for internal review by individual stakeholders
- Are the standard fleet maintenance processes still fit for purpose for the overhauled fleet?
- Monitor fleet performance to evaluate whether the overhauled fleet is delivering the projected performance and reliability improvements
- The data from overhaul can also be used to shape future maintenance and engineering change



3.5. 20PP Section 19: Outsourced Maintenance

Outsourcing is a strategic business decision taken by the train operator or lessor. The following best practice is intended for anyone who has already decided on outsourcing to make a success of the arrangement.

Types of outsourcing

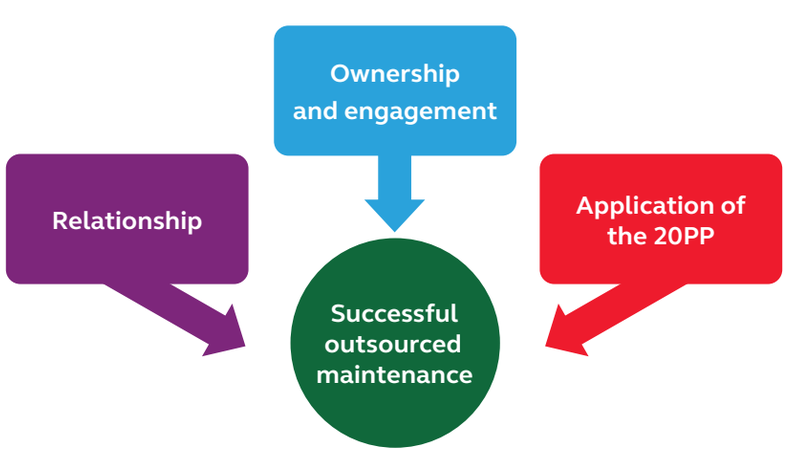
- Service provision contracts – maintenance company full control until train handed over for service at the depot outlet
- Full maintenance contracts – depot operationally controlled by the TOC but all engineering work is undertaken by the supplier
- Joint ventures – shared management of maintenance; work force may be drawn TOC and supplier
- Extended warranties – manufacturer has continuing on-site commitment to rectify defects
- Technical support contracts – supplier has ongoing obligation to provide depot-based technical support, which may be specialist
- Special projects – supplier undertakes a modification or reliability improvement programme

Whatever model is chosen, the contractual arrangements should be clear and simple so that accountability for service delivery is unambiguous. This is particularly important in a joint venture where it can be easy to forget who is responsible for what.

Why choose outsourcing?

To offset the technical risks associated with a new train fleet and ensure the train builder has a longterm stake in the success of its product	To obtain expertise and resources not available to the train operator To share commercial or logistical risk with an established partner	To obtain additional short-term or marginal resources and expertise

‘Golden Rules’



3. Third Party Activities

RULE 1. Relationships – partnerships for performance

The 'join' at working level between maintainer and train operator needs to be as seamless as possible to deliver a consistent and high-quality product to traincrew and passengers.

Partnership approach is essential for a long term contract

- Financial, industrial-relations etc, supplier problems could affect performance
- Usual contract sanctions (e.g. termination, renegotiation) may not be options
- Supplier failure to provide the service could be a potentially fatal TOC business risk

Organisational approach

- Complementary TOC and supplier organisations
- Empowerment of local contract managers
- Escalation of any disputes promptly to senior level, to keep front line focussed on train service provision
- Contract arrangements as seamless as possible – it's the joint output that matters

VTWC evolving relationship model Combative → Co-operative → Partnership → Collaborative

Cultural focus

- Joint training & team-building initiatives so that supplier workforce can empathise with TOC business dynamics (e.g. maintenance staff can ride trains in service and see performance from the passenger point of view)
- Regular liaison at senior management level, even when things are going well
- Building trust; local management teams must have confidence in their counterparts

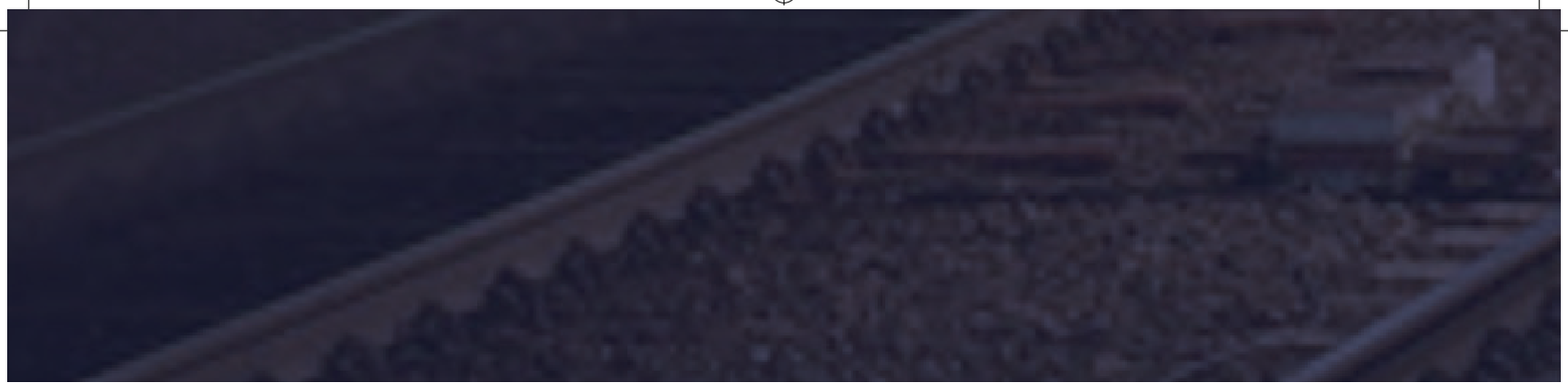
Carefully nurtured C2C/Bombardier relationship is key to excellent Cl. 357 fleet performance

RULE 2. Ownership and engagement – integrating the supplier into day-to-day operations

Teamwork – part of running the railway

- The real-time nature of a transport operation means that there is no time for contractual discussions or arms-length relationships
- If the supplier is only a partial player → treat as a division of the TOC's maintenance team
- If outsourcing is extensive → supplier to work closely with the operations delivery team
- Strong relationship with traincrew team to deal with problems at the driver/train interface
- The supplier should participate wholeheartedly in wider rail industry systems and initiatives

Seamless TPE/Siemens maintenance controller/technical rider team



Safety and competency

- Must be proactively managed by the TOC as the Railway Undertaking. In particular:
  - Competency assessments based tangible outputs linked to operational risks and hazards, not just on training records
  - Competency requirements to include supplier's managers and team leaders
  - Strong follow-up for technical safety problems
- If depot is still managed by TOC, then:
  - Ensure maintainer's method statements/risk assessments are bespoke to depot (not just generic)
  - Joint working on routine H&S such as safety tours and accident investigations

C2C/Bombardier joint approach to competency & HASAW at East Ham Depot

The TOC (as the Railway Undertaking) continues to 'own' the delivery of a safe, reliable train.

RULE 3. Application of the 20PP

Supplier and TOC need to work together to put the 20PP into practice.

Performance regimes and performance management

A robust and relevant performance regime:

- encourages the supplier through financial incentives
- provides a yardstick to judge the overall success of the contract
- should never be seen as a way of punishing the supplier

Northern/Alstom new contract for Class 323 maintenance led to significantly improved performance

In structuring the contract, the performance regime must:

- Reflect the KPIs by which the TOC itself is judged
- Have mind-focussing – not punitive – individual penalties, matched to TOC's business risk
- Be of a potential financial value to support a supplier's business case for investment

Regime to cover customer service on-train issues (e.g. toilets, information, catering, etc).

For successful performance management, both parties must:

- Adequately resource reporting, measurement and monitoring systems
- Establish the facts of any incident as quickly as possible
- Settle routine claims promptly, avoiding a backlog of unresolved disagreements

To be successful, the performance regime must be backed up with positive contract management and a will to succeed. Financial penalty payments are far less desirable compared to good contract delivery.

3. Third Party Activities

Maintenance planning

Goal – reliability and availability maximised through optimal maintenance

- TOC should exercise its rights of approval over the maintenance regime
- Rolling stock owner may need to check that maintenance is being carried out properly

Points to watch include:

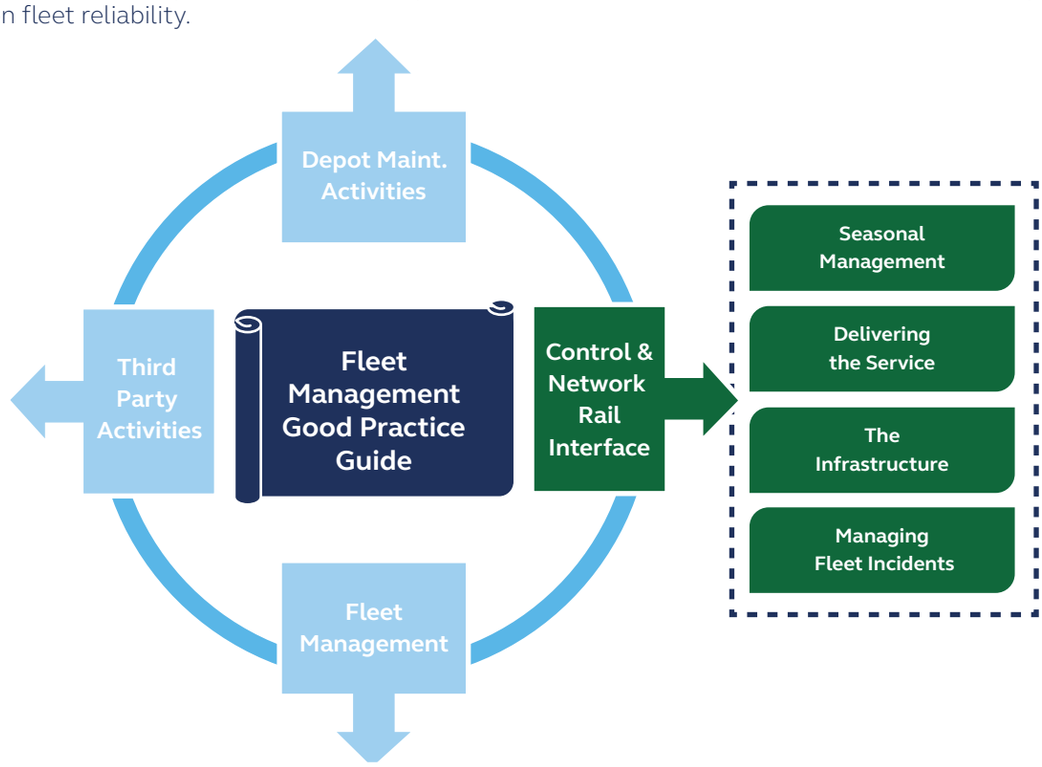
- Check that train maintenance frequencies are as contracted
- All parts/sub-systems adequately covered in the maintenance regime (see Appendix D of 20PP for risk model)
- Maintenance schedule to be bespoke to the service requirements of the particular fleet (no 'generic' schedules)
- Exercise rights to approve changes to the schedule
- Seek C4-to-C4 warranties where appropriate

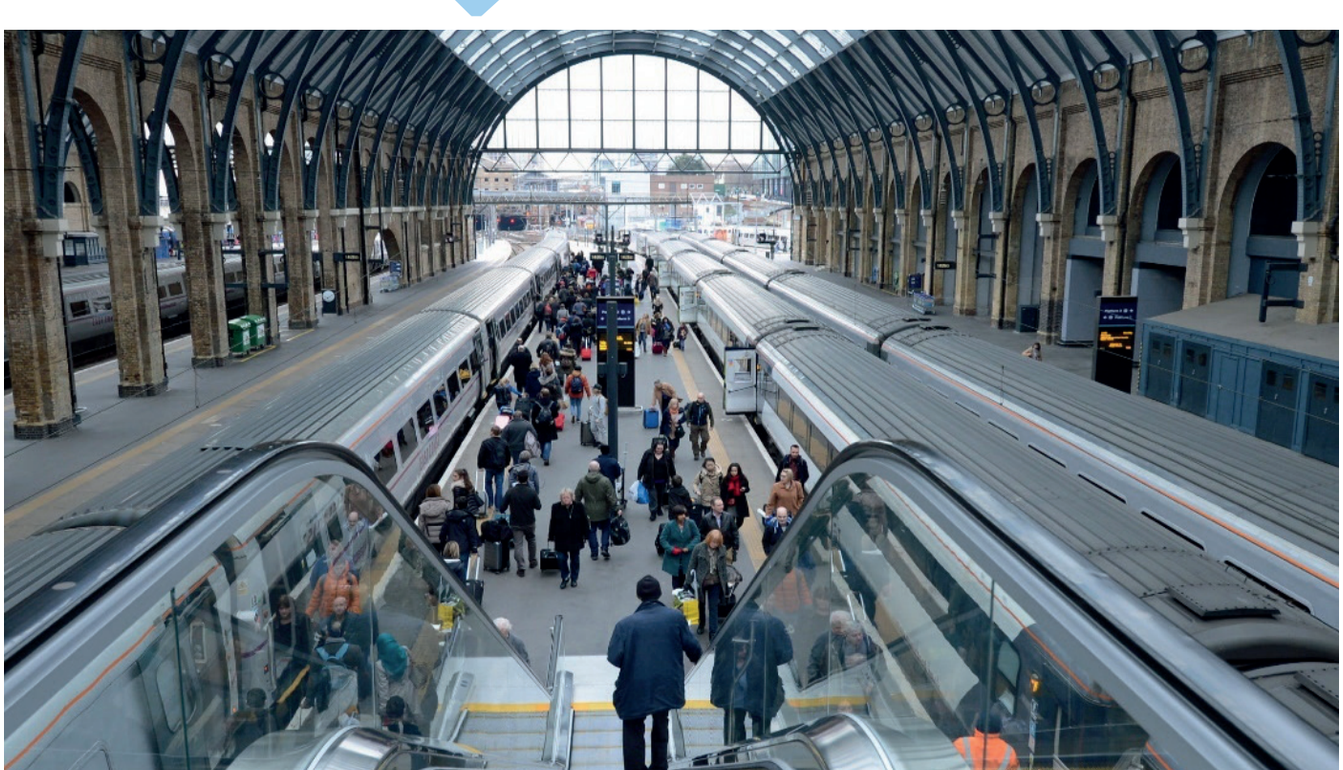
Operational decisions affecting maintenance delivery best taken by the TOC so that the associated risks are managed by the people accountable for overall service delivery.

Important for the TOC to have overview of contract staff undertaking modifications or reliability improvement programmes

4. Control & Network Rail Interface

This section of the Condensed Guide focuses on those activities that take place out on the running railway, over seen by a TOC's Control function and Network Rail. In this environment, not all issues are within the TOC's control; there is therefore the need to plan, liaise with third parties and react in real time to minimise service disruption and the impact on fleet reliability.





4. Control & Network Rail Interface

4.1. 20PP Section 4: Seasonal Management

Seasonal ambient temperature variations and weather can adversely affect the performance of traction, rolling stock and rail head conditions if they are not recognised and planned for. To maximise fleet performance during seasonal variances, operations and engineering need to work together to produce robust and effective management plans. A weather calendar or seasonal preparation plan should be visible at all levels, with analysis of previous data and KPIs for monitoring to promote continual improvement.

Planning for winter

Degradation of fleet condition and deferral of maintenance will be inevitable during bouts of extreme winter weather. Good preparation beforehand, including reducing outstanding work, is essential to ensure good service reliability and availability. **GEGN8628** captures lessons learned and good practice.

Standard winter preparedness

Ensure an acceptable level of winter operation can be maintained.

- Review effectiveness of standard winterisation tasks
- Specific winter exams (that are not lost within general exams)

Stock holdings – key material review, Kilfrost/rock salt, deployment of critical spares to strategic locations

Safety and performance risks – Winter 'survival kits'

Depot & infrastructure – key plant (wash plants, fuel points), road vehicles (snow chains, 4x4s), equipment (shovels), etc

Operations planning

- Review of business continuity plans, operational trigger points, cut-and-run policy, key decision-makers
- Winter competence development/ training plan
- Access to the depot
- Staff deployment to maintain the service

Weather forecasting management – 28 day/7 day/24 hour, Extreme Weather Advisory Team (EWAT), **www.nrws.co.uk** – Network Rail weather forecasting facility

Delay attribution – temporary measures to allow for recovery

Extreme winter preparedness

Implement short-term measures to react to emerging trends.

Trigger events – clearly defined for when extreme weather is forecast.

Pre-service start up conference call

- Joint engineering-operations-control review of realistic stock availability for a reliable service
- Levels of degradation of rolling stock

Cleaning and servicing strategy

- Focus on key systems (couplers, doors, etc.)
- Key supplies (de-icers, thaw granules)

Failure review and forward planning meetings (at least daily)

- What issues are emerging?
- Collate data downloads
- Capture of issues for future continuous improvement

Depot & infrastructure maintenance

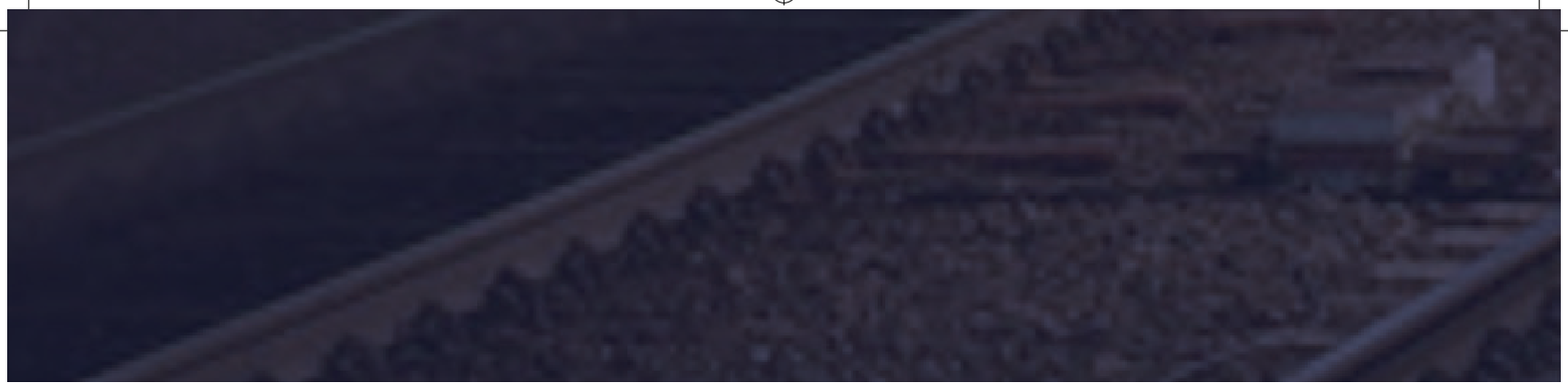
- Keep critical routes clear for access around depots/ service points
- Staff welfare provisions
- Depot facilities (utilities, walkways, car parks, etc.)
- 3rd rail icing/de-icing

Operations planning

- Train preparation/disposal (e.g. leave trains powered up)
- Support for drivers at start-up locations

Communications strategy

- Key roles, decision-makers, delegated authorities
- Media management
- Passenger communications (CIS) and Internet



Extreme winter operation

Service running

- Establish clear lines of communication from frontline staff (traincrew, fleet managers, station managers, etc) to service planners
- High-level monitoring and review team to co-ordinate plan in response to stock availability/ reliability, traincrew availability, local weather conditions, passenger levels

Preserving the service during operation

- De-icing and removal of snow from critical systems/components at pre-determined locations, e.g. lights/horn, door gear, wipers
- Consider utilising non-frontline staff for preservation tasks
- Where possible, keeping the stock in a warm condition or keeping units powered up continuously
- Battery management where infrastructure allows for charging passenger levels

Timetable change info

- Update TRUST, station posters, website, PIS
- Pre-printed info for operational staff

Passengers vulnerable to the elements

- Blankets, refreshments
- Priority passenger alighting

Extreme winter recovery

- Fleets can suffer extensive damage during extreme weather
- Post extreme winter checks for all affected vehicle systems, i.e. door set up, electrical connectors, axle damage from ice balls containing ballast, etc
- Maintenance recovery – fleet to re-enter its cycle of maintenance at earliest possible opportunity
- Maintenance containment to account for likely reduced material and spares reduced availability
- Temporarily increase resources/sub-contract to minimise recovery time

Southern utilised Bombardier technical staff to temporarily repair defective ACM modules

Post winter review

- Learn lessons and implement changes to plans for future extreme weather events, effects of climate change, e.g.
  - Winterisation tasks within maintenance plan;
  - Modifications to improve winter resilience (e.g. traction motors ducting systems);
  - Revised materials and logistics plans with key suppliers (incl. ROSCOs);
  - Not 'accepting' known winter failure modes ('wrong type of snow'(!));
  - Review ROSCO and/or maintainer stock holdings
- Delay attribution – segregation of winter failure modes (within BUGLE) to enable post winter review and planning for subsequent years

4. Control & Network Rail Interface

Other considerations

- Train procurement specification – incorporate lessons learned from extreme winter operation into Key Train Requirements (KTRs)

Summer

Temperature variance within the summer months can be quite dramatic.

Fleet actions to prioritise

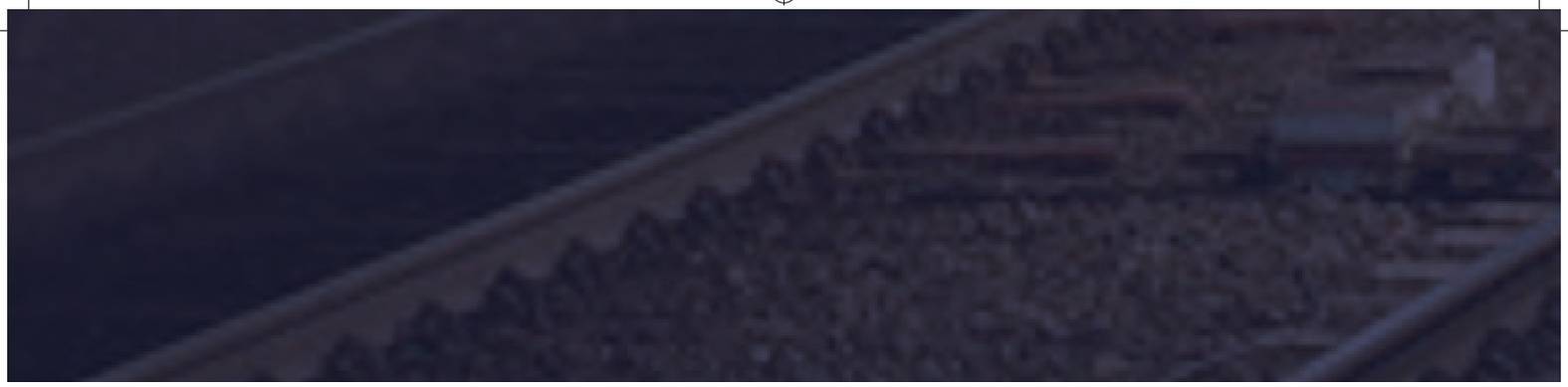
- Cab and saloon air conditioning equipment should be fully serviced and functional
- Air flow paths for cooling (e.g. electronic racks, traction motors) are clear of debris, filters cleaned/serviced, fans working
- Radiators fully topped up with coolant and clear of debris, e.g. dandelion seeds to ensure maximum air flow
- Windscreens are cleaned regularly and washer bottles topped up
- Door systems – check bearings and rubber joints for degradation, summer adjustments to avoid binding of the door system
- CET tanks to be emptied on a regular basis to minimise odours and the spread of germs

Infrastructure

- Assist Network Rail to identify Critical Rail Temperature (CRTs) sites for buckling risk and manage speed restrictions and the potential impact of the train plan
- Consider depot infrastructure items vulnerable to extreme temperatures, and consequent risks to ability to deliver the service

Management of the environment to ensure depot safety

- Infestations (insects, vermin), Birds (nests, etc.), Waste management



Autumn

Leaf fall is the overriding consideration.

Fleet actions to prioritise

- Wheelset management:
  - Fleet wheelset condition check prior to autumn, check WSP is in good working order
  - Get ahead of schedule with pre-planned tyre turning, planned maintenance of wheel lathe
  - Get ahead of schedule with planned lifts to free up space for unplanned wheelset changes, have wheelsets in stock
  - Keep units with low wheel life expectancy within local wheel lathe area
- Sanding equipment health checks plus good supply of correct grade of sand
- Scrubber blocks:
  - What trains can be fitted
  - What percentage of the wheelsets to be fitted
  - Manage leaf mulch build up under units
- Focus on traction system performance, awareness of DC motors supply chain issues.
- Keep Door pocket guides and runners clear of leaves
- Agreed TOC contingency plan for reduced fleet availability; critical spares availability

Operations and Infrastructure

- Autumn timetables, to allow extra time on those routes most likely to be affected
- Review low adhesion sites with NR, site risk can change year-on-year
- Traincrew, briefings on defensive driving, reporting of poor traction hot spots
- *Autumn surgeries;* feedback between drivers, management and Network Rail; traincrew depot whiteboards for feedback on performance-related issues
- *Assist with vegetation management;*
  - Do not sweep leaves onto the line (sweep and bag);
  - Identification of vegetation hot spots (high-risk sites)
- Joint management and deployment of rail head treatment train; start and finish dates for the rail head treatment train

Northern Rail ride with drivers to help Network Rail identify adhesion risk areas

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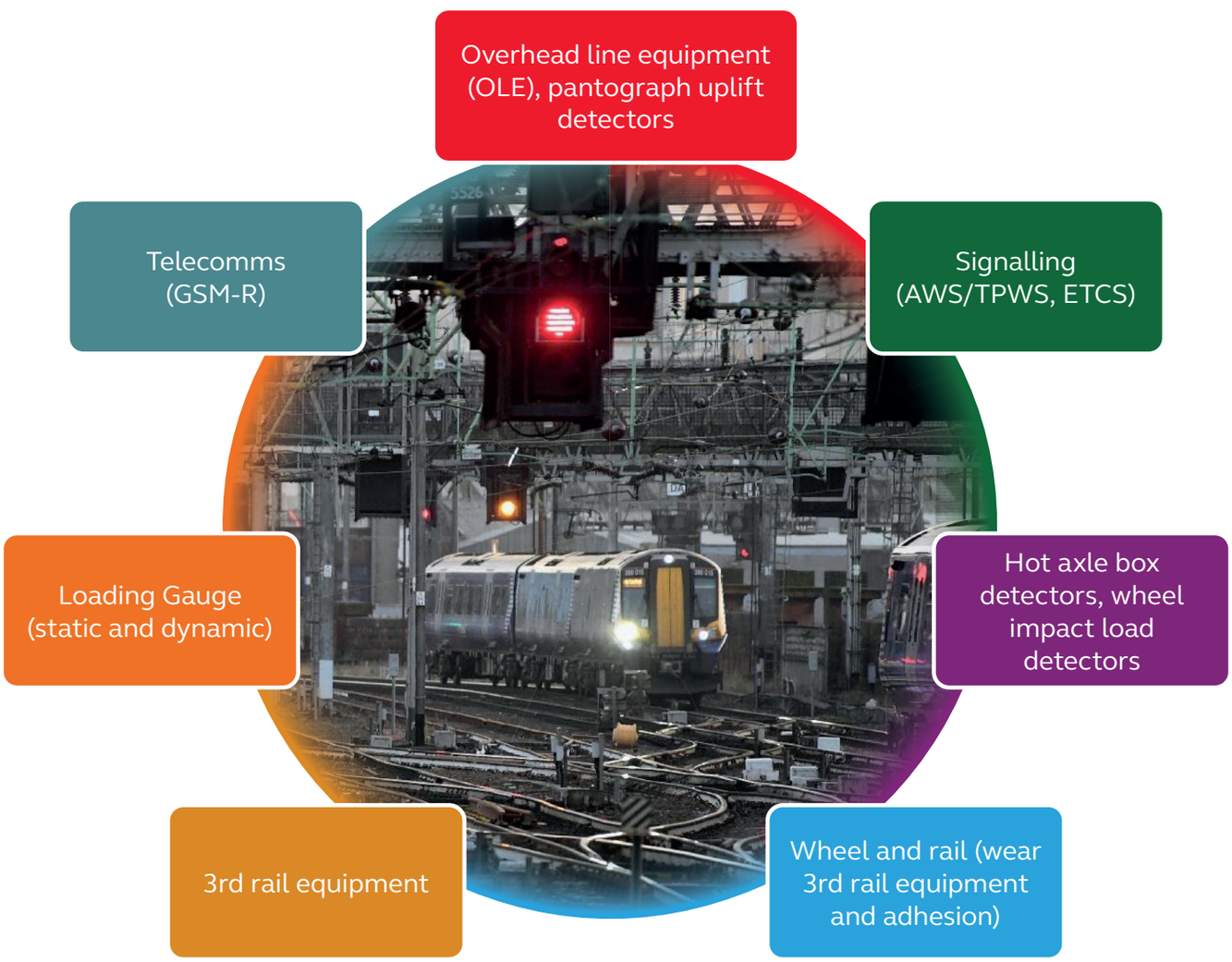
4.2. 20PP Section 12: The Infrastructure



The main engineering interfaces between rail vehicles and infrastructure are illustrated above.

Whilst most of these interfaces are obvious, train performance can be influenced by less obvious interactions.

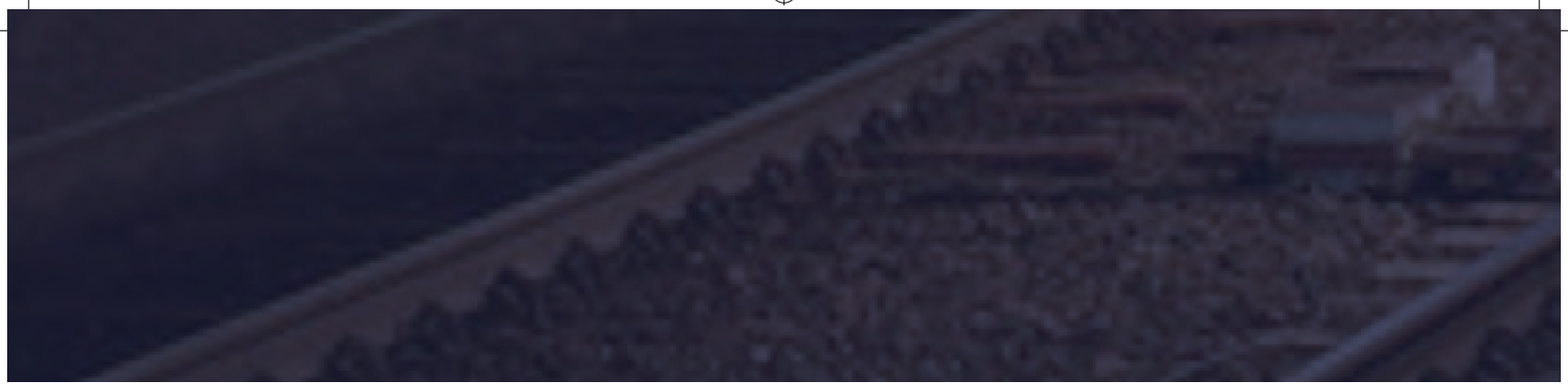
Network Rail has Customer Relationship Teams to engage with TOCs to improve network performance and safety.

AGA AWS code 10 failures at Ilford station due a length of new rail in the 4 foot

Customer liaison

There should be regular TOC-Network Rail liaison to provide a platform for communication, understanding and resolution of rail vehicle risk and performance issues. It has often been stated that having a single point of contact is a great asset.

Historically, ScotRail liaised with RVIE over an aggressive flange wear problem affecting



NR Customer Relationship Teams: Core Activities

Rail vehicle monitoring

- Incidents recorded in a dedicated database (non-exhaustive)
- Control centre incident logs (CCIL) are primary source of information
- Incidents categorised, e.g. collisions/derailments, component detachment, wheels/bearings, signalling systems etc
- Resolution through liaison with the relevant stakeholders
- Long-term mitigation to prevent reoccurrence
- Improved safety and reliability of the infrastructure

Technical support

- Provision of engineering expertise to reduce time spent by non-vehicle specialists
- Expedient resolution of commercial claims
- Work with TOC fleet team and Network Rail engineering/maintenance teams
- Formal investigations into serious incidents involving rail vehicles
- Monitor implementation of HLOS schemes on rail vehicles
- Delay resolution assistance – fleet
- Proposed changes to rail vehicle operations in the route (NETWORK CHANGE)
- Interface working groups
- Sharing best practices and new technologies, e.g. new Scottish RETB base stations

Interface working groups

- Network Rail and TOC working together to resolve identified interface issues affecting fleet performance
  - Provides a focal point to highlight interface issues as they arise
  - Establish root causes and jointly identify beneficial solutions
  - Reduced delays/costs → Improve the efficiency of the network
  - Improve asset life for both rail vehicles and infrastructure
  - Knowledge hub of system interface engineering
  - Identify interface capabilities and limitations, challenge those where appropriate
  - Harmonise vehicle/infrastructure interaction

Southern/Net. Rail joint engineering root cause investigations within seven days

First Capital Connect (now GTR) reduced wheel flange grease lubrication resolved through enquiry to NR

Preventing engineering interaction problems before they start

- NR can provide engineering support to review system network compatibility for new fleets or modifications to existing fleets
- This can be in addition to the formal process through RIS-8270-RST.
- NR can assist during the early stages of the engineering change process to identify any issues that can be resolved in advance of committed work being carried out

4. Control & Network Rail Interface

4.3. 20PP Section 13: Managing the Impact of Fleet Incidents on the Railway

A joint fleet-operations approach to fleet incident management can reduce incident times and improve performance, based on a 'Plan, Do, Review' process.

1. Plan

Roles and responsibilities *RACI (Responsible, Accountable, Consulted and Informed) for the incident management team.*

- As well as usual control staff, other potential roles within the team can include:
  - Signaller, Electrification Controller, CCTV operators
  - Media managers (Twitter, etc.), Passenger Information System controller
  - British Transport Police (BTP) liaison
- Control staff need to be protected from distractions in order to best perform in an incident
- Make information regarding, e.g. large sporting events available, that may lead to excessive passenger loadings

Have a NR presence within control or TOC control co-located with NR

Clear lines of communication *Use contemporary means such as email, (mobile) telephone and other electronic format (not fax machines and paperwork!).*

- Consider use of web conferencing (a good free one is Free Web Conferencing)
- Plan to keep passengers informed/updated as a priority to avoid uncontrolled reaction
- Train drivers in standardised Driver/signaller communications with signallers

Southern used call centre trainer to develop control staff protocol for the 'phone a friend' policy

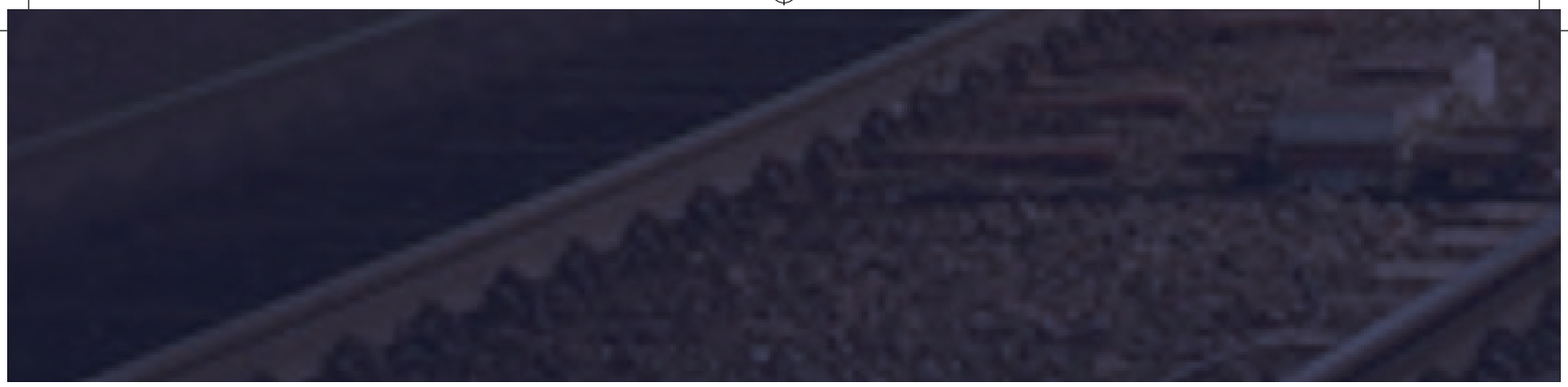
West Coast-Alstom visualisation board within the control, updated as incidents occur

Training and competence *Aim for a situation of 'unconscious competence' (i.e. able to respond rapidly in a dynamic situation).*

- Incident management training include familiarity with the Rule Book and company's procedures
- 20PP contains links to online competence assessment systems and guides
- Decision support tools and checklists can help reduce the likelihood of mistakes. Good practice is detailed in Appendix I of the 20PP
- Control centres Fleet engineers to spend time on depots and on the route, to maintain familiarity
- RDG's Good Practice Guide **(GPG005)** on Controller Recruitment

SWT checklist based on the Right Time Railway Assurance Check (standard aviation practice)

East Coast role-play exercises based on past incidents using exact imitations of control desks)



Resources

Train plan recovery dependent on the availability of replacement traincrew/vehicles and management of disrupted resources.

- Disruption during the middle of the day – 'peak period' units may be available
- The 'cut and run' procedure (where possible) to get other trains back running ASAP
- In highly congested area with multiple TOCs and FOCs operate, Network Rail should lead
- Relevant tools and equipment for line-of-route fitters to get trains moving ASAP
- 'Thunderbird' rescue locomotive concept inc. cover for loss of AC or DC traction power
- A consistent starting point/initial framework for incident mitigation can help reduce the impact of fleet incidents
- Driver availability is crucial; reduced flexibility at night when fewer drivers are available

Joint Northern-TPE contingency plan to mitigate incident impact in Manchester area

2. Do

Primary delay	*Secondary (reactionary) delay*
results from an incident that **directly** delays the train concerned.	an **indirect** delay that is the result of a prior delay to the same or another train.

Incident management is a reactionary situation and can be an unfamiliar/intimidating environment for the driver.

➤ Priority in an incident to is get the vehicle moving at the earliest opportunity (not try and fix the train!) (see section 1.3)

4. Control & Network Rail Interface

A train failure can quickly escalate into a major incident!

Decide

- Imperative to clearly identify the common goal (e.g. moving or fix the train)
- Develop two plans in parallel when awaiting, e.g. fitter exam of train
- Assume worst-case scenarios; mobilise maint. staff; prepare for rescue
- Emergency services may be required to assist in certain instances:
  - this may impact incident management and network recovery time
  - may not be familiar with railway rules
  - communication between parties is critical
- Route control manager ensures the plan is communicated effectively to all

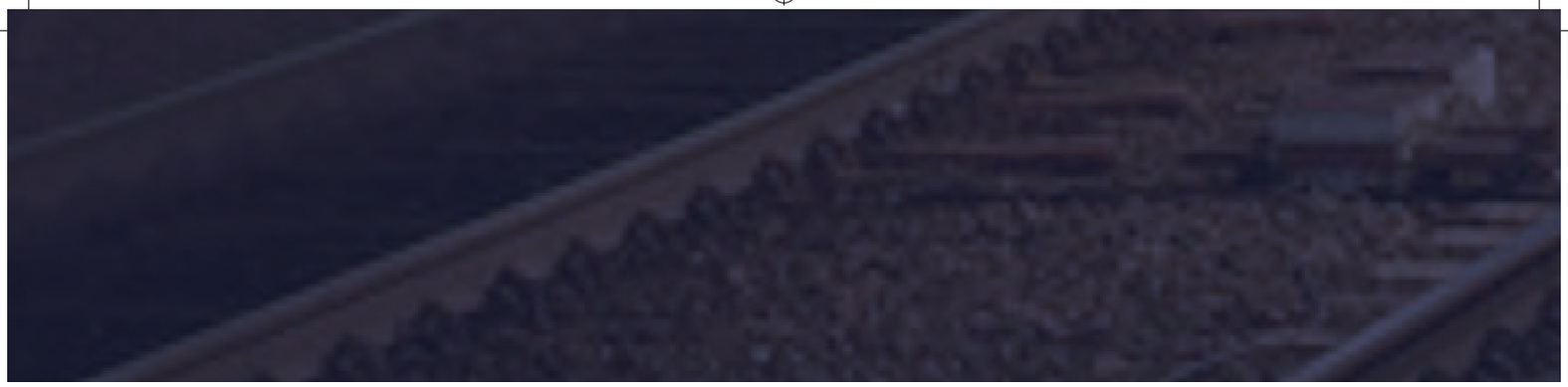
Southern control 5-minute 'huddle' to cover details of the incident and the recovery plan

Enact

- Special Moves Plan (SMP) required if fault is catastrophic (e.g. brakes require isolating for movement)
- Controlled evacuations where possible move the train (under assistance) to a safe point away from running traffic
- Assisting a train from the front using a wrong direction move is normally faster than trying to assist in rear with a non-compatible unit
- Emergency coupling – pre-fit/extend on the failed unit prior to recovery

Monitor

- Proactive stance leads to faster recovery
- Ensure live monitoring of the initial recovery plan is in place, be in touch with the staff on site and have a primary contact
- Confirm that Network Rail understand DOTE safety implications with a significant failure
- Use communications systems once estimated movement times are known



Review (post incident)

Evaluate the management and processes used, to improve future response to similar incidents

- Agree only a few timely actions* from an incident review (*leading and measurable)
- Merge technical and operations reviews (focusing on the right area)
- Always use targeted, meaningful and (if possible) tailored feedback
- Offer explanations, in particular to traincrew, as to why certain decisions/actions were taken

SWR control Incident Learning Reviews (ILR) utilised by Network Rail to review 1000+ min. delay incidents

Feedback to operations managers and all staff involved for learning and best practice sharing

- Create a contingency plans 'knowledge pot' where ideas and experience can be shared
- Incident reviews may be subject to recommendations from third parties such as RAIB